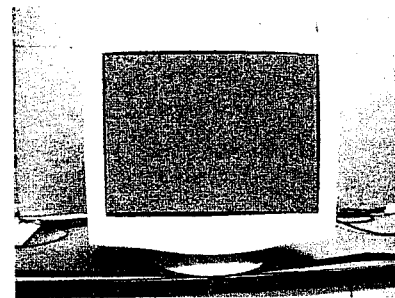


# 21" Auto scan Colour Monitor

## Service Service Service



DDC/Power saving/TCO

# Service Manual

Horizontal frequencies  
30 - 107kHz

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REFER TO BACK COVER FOR IMPORTANT SAFETY GUIDELINES

### SAFETY NOTICE

ANY PERSON ATTEMPTING TO SERVICE THIS CHASSIS MUST FAMILIARIZE HIMSELF WITH THE CHASSIS AND BE AWARE OF THE NECESSARY SAFETY PRECAUTIONS TO BE USED WHEN SERVICING ELECTRONIC EQUIPMENT CONTAINING HIGH VOLTAGES.

CAUTION: USE A SEPARATE ISOLATION TRANSFORMER FOR THIS UNIT WHEN SERVICING.

## IMPORTANT SAFETY NOTICE

Proper service and repair is important to the safe, reliable operation of all \_\_\_\_\_ Consumer Electronics Company\*\* Equipment. The service procedures recommended by \_\_\_\_\_ and described in this service manual are effective methods of performing service operations. Some of these service operations require the use of tools specially designed for the purpose. The special tools should be used when and as recommended.

TO ENSURE THE CONTINUED RELIABILITY OF THIS PRODUCT, USE ONLY ORIGINAL MANUFACTURER'S REPLACEMENT PARTS, WHICH ARE LISTED WITH THEIR PART NUMBERS IN THE PARTS LIST SECTION OF THIS SERVICE MANUAL.

It is important to note that this manual contains various CAUTIONS and NOTICES which should be carefully read in order to minimize the risk of personal injury to service personnel. The possibility exists that improper service methods may damage the equipment. It also is important to understand that these CAUTIONS and NOTICES ARE NOT EXHAUSTIVE. \_\_\_\_\_ could not possibly know, evaluate and advise the service trade of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently, \_\_\_\_\_ has not undertaken any such broad evaluation. Accordingly, a servicer who uses a service procedure or tool which is not recommended by \_\_\_\_\_ must first satisfy himself thoroughly that neither his safety nor the safe operation of the equipment will be jeopardized by the service method selected.

\*\* Hereafter throughout this manual, \_\_\_\_\_ Consumer Electronics Company will be referred to as \_\_\_\_\_

### WARNING

Critical components having special safety characteristics are identified with a **▲** by the Ref. No. in the parts list and enclosed within a broken line\* (where several critical components are grouped in one area) along with the safety symbol **▲** on the schematics or exploded views.

Use of substitute replacement parts which do not have the same specified safety characteristics may create shock, fire, or other hazards.

Under no circumstances should the original design be modified or altered without written permission from \_\_\_\_\_ assumes no liability, express or implied, arising out of any unauthorized modification of design. Servicer assumes all liability.

\* Broken Line 

# Technical Data

3

## Technical Specification\*

### CRT

Size and deflection	: 21 inch/51cm, 90° deflection angle
Dot pitch/Grille pitch	: 0.25mm
Horizontal pitch	: 0.21mm
Tube type	: Shadow mask, flat square, high contrast, antiglare, anti-static, anti-reflection, light transmission 43%
Phosphor	: P22
Recommended display area	: 15.4"x11.6"/392 x 294 mm
Maximum display area	: 16.0"x12.0"/406 x 305 mm
Scanning	
Horizontal scanning	: 30 - 107 KHz
Vertical scanning	: 50 - 160 Hz
Video	
Video dot rate	: 261 Mhz
Input impedance	
-Video	: 75 Ohm
- Sync	: 2.2 kOhm
Input signal levels	: 0.7Vpp
	Separate sync
Sync input signal	: Composite sync
Sync polarities	: Positive and negative

### White Color Temperature

#### Chromaticity CIE coordinates:

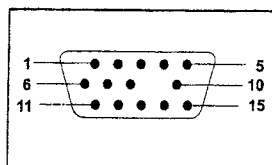
at 9300 °K	x = 0.283	y = 0.297
6500 °K	x = 0.313	y = 0.329
5500 °K	x = 0.332	y = 0.347

### Physical Specifications

Dimensions	: 482x476x467mm(including base) 482x437x428mm(excluding base)
weight	: 28.0 Kg
Power supply	: 90 - 264 VAC, 50/60HZ
Power consumption	: <160 Watt
Operating condition	
Temperature	: 0 °C - 40 °C
Relative Humidity	: 10 % - 90 %
Storage condition	
Temperature	: - 25 °C - 60 °C
Relative Humidity	: 5 % - 95 %

### Pin assignment :

The 15-pin D-sub connector(male) of the signal cable (IBM systems) :



Pin No.	Assignment	Pin No.	Assignment
1	Red video input	9	No pin
2	Green video input	10	Logic ground
3	Blue video input	11	Identification output - Connected to pin 10
4	Identification output - Connected to pin 10	12	Serial data line(SDA)
5	Ground	13	H.Sync /H+V
6	Red video ground	14	V.Sync(VCLK for DDC)
7	Green video ground	15	Data clock line(SCL)
8	Blue video ground		

## Automatic Power Saving

If you have VESA's DPMS compliance display card or software installed in your PC, the monitor can automatically reduce its power consumption when not in use. And if an input from a keyboard, mouse or other input devices is detected, the monitor will automatically "wake up". The following table shows the power consumption and signalling of this automatic power saving features :

Power Management Definition						
VESA's mode	VIDEO	H-SYNC	V-SYNC	POWER USED	POWER SAVING %	LED COLOR
ON	Active	Yes	Yes	< 104 W	0 %	Green
Stand-by	Blanked	No	Yes	< 7 W	93 %	Yellow
Suspend	Blanked	Yes	No	< 7 W	93 %	Yellow
OFF	Blanked	No	No	< 2.8 W	97 %	Amber

This monitor is Energy Star® compliant. As an ENERGY STAR® Partner, we have determined that this product meets the ENERGY STAR® guidelines for energy efficiency.

## Regulatory Information

## TCO'92 and TCO '99 Information

## Why do we have environmentally labeled computers?

In many countries, environmental labeling has become an established method for encouraging the adaptation of goods and services to the environment. The main problem, as far as computers and other electronics equipment are concerned, is that environmentally harmful substances are used both in the products and during their manufacture. Since it is not so far possible to satisfactorily recycle the majority of electronics equipment, most of these potentially damaging substances sooner or later enter nature.

There are also other characteristics of a computer, such as energy consumption levels, that are important from the viewpoints of both the work (internal) and natural (external) environments. Since all methods of electricity generation have a negative effect on the environment (e.g. acidic and climate-influencing emissions, radioactive waste), it is vital to save energy. Electronics equipment in offices is often left running continuously and thereby consumes a lot of energy.

## What does labeling involve?

This product meets the requirements for the TCO'99 scheme which provides for international and environmental labeling of personal computers. The labeling scheme was developed as a joint effort by the TCO (The Swedish Confederation of Professional Employees), Svenska Naturskyddsforeningen (The Swedish Society for Nature Conservation) and Statens Energimyndighet (The Swedish National Energy Administration).

Approval requirements cover a wide range of issues: environment, ergonomics, usability, emission of electric and magnetic fields, energy consumption and electrical and fire safety.

The environmental demands impose restrictions on the presence and use of heavy metals, brominated and chlorinated flame retardants, CFCs (freons) and chlorinated solvents, among other things. The product must be prepared for recycling and the manufacturer is obliged to have an environmental policy which must be adhered to in each country where the company implements its operational policy.

The energy requirements include a demand that the computer and/or display, after a certain period of inactivity, shall reduce its power consumption to a lower level in one or more stages. The length of time to reactivate the computer shall be reasonable for the user.

Labeled products must meet strict environmental demands, for example, in respect of the reduction of electric and magnetic fields, physical and visual ergonomics and good usability.

Below you will find a brief summary of the environmental requirements met by this product. The complete environmental criteria document may be ordered from:

## Environmental Requirements

## Flame retardants

Flame retardants are present in printed circuit boards, cables, wires, casings and housings. Their purpose is to prevent, or at least to delay the spread of fire. Up to 30% of the plastic in a computer casing can consist of flame retardant substances. Most flame retardants contain bromine or chloride, and those flame retardants are chemically related to another group of environmental toxins, PCBs. Both the flame retardants containing bromine or chloride and the PCBs are suspected of giving rise to severe health effects, including reproductive damage in fish-eating birds and mammals, due to the bio-accumulative\* processes. Flame retardants have been found in human blood and researchers fear that disturbances in fetus development may occur.

The relevant TCO'99 demand requires that plastic components weighing more than 25 grams must not contain flame retardants with organically bound bromine or chlorine. Flame retardants are allowed in the printed circuit boards since no substitutes are available.

## Cadmium\*\*

Cadmium is present in rechargeable batteries and in the color-generating layers of certain computer displays. Cadmium damages the nervous system and is toxic in high doses. The relevant TCO'99 requirement states that batteries, the color-generating layers of display screens and the electrical or electronics components must not contain any cadmium.

## Mercury\*\*

Mercury is sometimes found in batteries, relays and switches. It damages the nervous system and is toxic in high doses. The relevant TCO'99 requirement states that batteries may not contain any mercury. It also demands that mercury is not present in any of the electrical or electronics components associated with the labeled unit.

## CFCs (freons)

The relevant TCO'99 requirement states that neither CFCs nor HCFCs may be used during the manufacture and assembly of the product. CFCs (freons) are sometimes used for washing printed circuit boards. CFCs break down ozone and thereby damage the ozone layer in the stratosphere, causing increased reception on earth of ultraviolet light with increased risks e.g. skin cancer (malignant melanoma) as a consequence.

## Lead\*\*

Lead can be found in picture tubes, display screens, solders and capacitors. Lead damages the nervous system and in higher doses, causes lead poisoning. The relevant TCO'99 requirement permits the inclusion of lead since no replacement has yet been developed.

\* Bio-accumulative is defined as substances which accumulate within living organisms.

\*\* Lead, Cadmium and Mercury are heavy metals which are bio-accumulative.

## Energy Star Declaration

This monitor is equipped with a function for saving energy which supports the VESA Display Power Management Signaling (DPMS) standard. This means that the monitor must be connected to a computer which supports VESA DPMS to fulfill the requirements in the NUTEK specification 803299/94. Time settings are adjusted from the system unit by software. From indicated inactivity to Power Saving Position A2, the total time must not be set to more than 70 minutes.

## NUTEK

## Federal Communications Commission (FCC) Notice (U.S. Only)

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

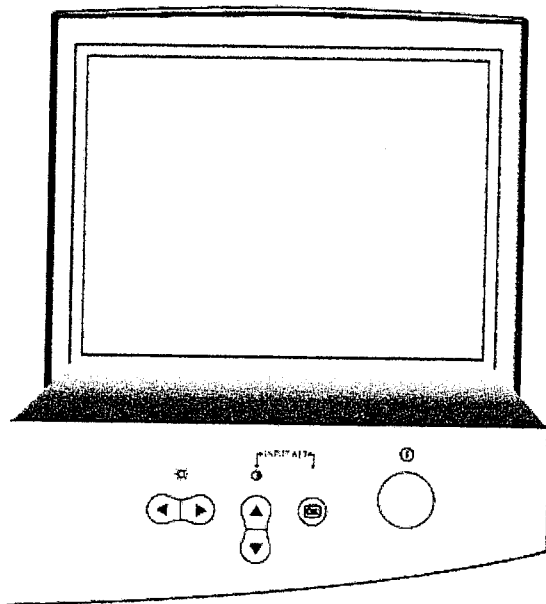
Use only RF shielded cable that was supplied with the monitor when connecting this monitor to a computer device.

To prevent damage which may result in fire or shock hazard, do not expose this appliance to rain or excessive moisture.

THIS CLASS B DIGITAL APPARATUS MEETS ALL REQUIREMENTS OF THE CANADIAN INTERFERENCE-CAUSING EQUIPMENT REGULATIONS.



Front View



Power button switches your monitor on.



OK button which when pressed will take you to the OSD controls



Contrast hotkey. When the UP arrow is pressed, the adjustment controls for the CONTRAST will show up.



UP and DOWN buttons are used when adjusting the OSD of your monitor



Brightness hotkey. When both the LEFT and RIGHT arrows are pressed at the same time, then the adjustment controls for BRIGHTNESS will show up.

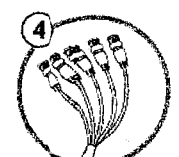
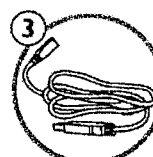
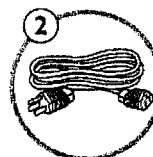
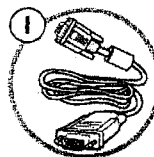
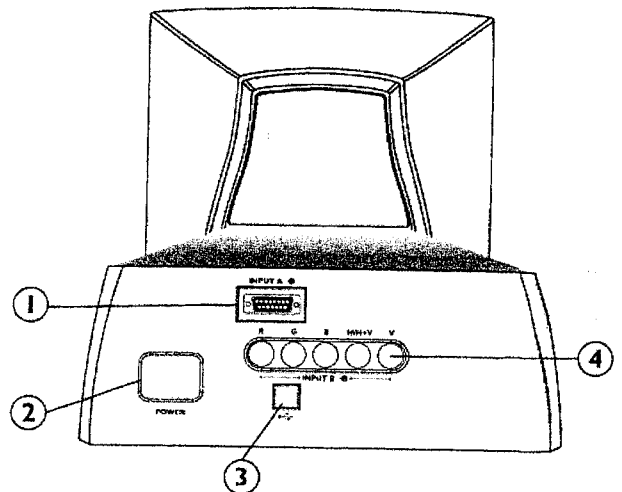


LEFT and RIGHT buttons, like the UP and DOWN buttons, are also used in adjusting the OSD of your monitor.



By pressing both the UP and OK buttons, you can easily access the Input Signals A and/or B.

Rear View



1. D-Sub Port - Attach the D-Sub connector that comes with your monitor here. Other end connects to your PC.

2. Power in - Attach power cable here.

3. USB Port - Attach your USB Upstream cable here. Connect the other end to your USB hub or your PC's USB connector.

4. BNC Connectors - Attach the connectors here to get the best video performance from your monitor

## On-Screen Display




Description of the On-Screen Display   The OSD Tree   The OSD Controls

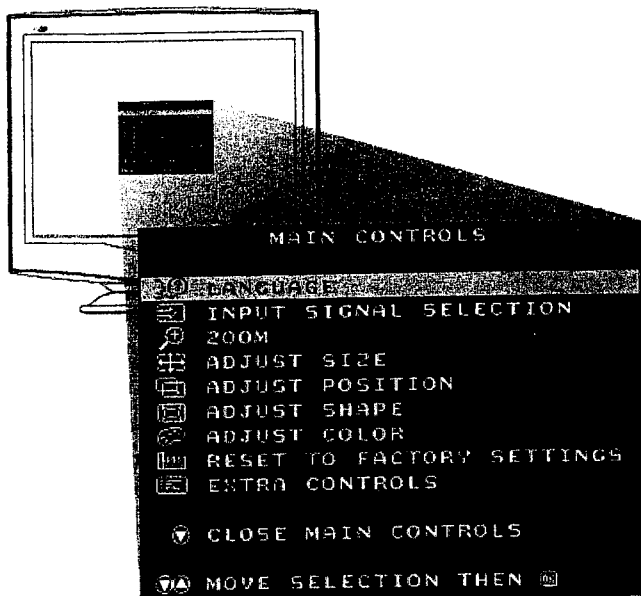
### Description of the On Screen Display

What is the On-Screen Display?

This is a feature in all monitors which allows an end-user to adjust screen performance of monitors directly through an on-screen instruction window. The user interface provides user-friendliness and ease-of-use when operating the monitor.

Basic and simple instruction on the control keys.

On the front controls of your monitor, once you press the  button, the On Screen Display (OSD) Main Controls window will pop up and you can now start making adjustments to your monitor's various features. Use the  or  the keys to make your adjustments within.



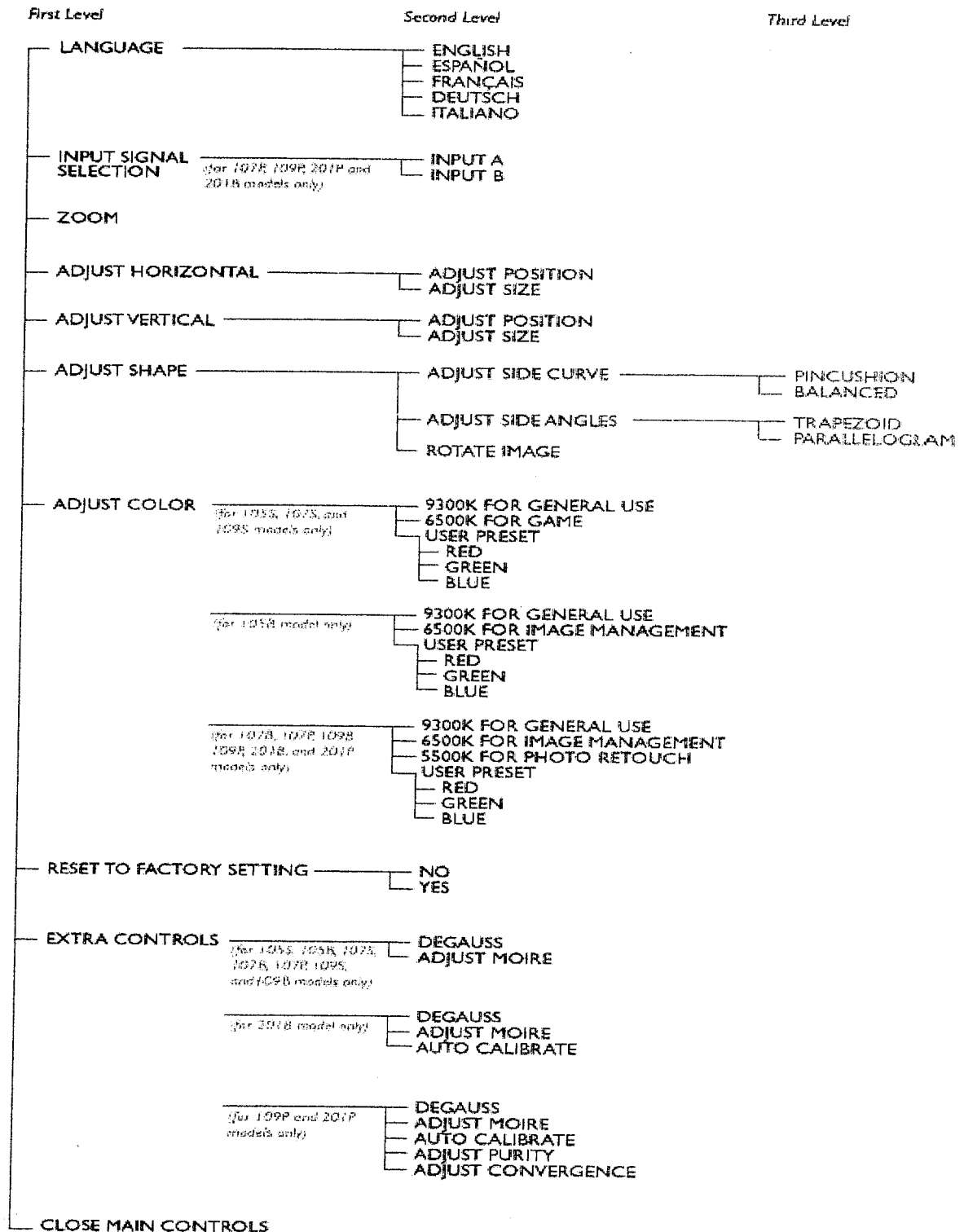
### The OSD Tree

Below is an overall view of the structure of the On-Screen Display. You can use this as reference when you want to later on work your way around the different adjustments.

# OSD menu tree structure

## The OSD Tree

Below is an overall view of the structure of the On-Screen Display. You can use this as reference when you want to later on work your way around the different adjustments.





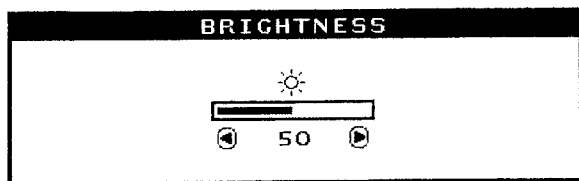
## OSD Adjustments





### The OSD Controls

#### BRIGHTNESS

To adjust your screen's brightness, follow the steps below. Brightness is the overall intensity of the light coming from the screen. A 50% brightness is recommended.

- 1) Press the  or  button on the monitor. The BRIGHTNESS window appears.





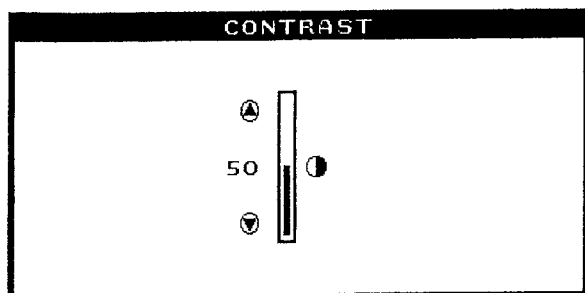
- 2) Press the  or  button to adjust the brightness.
- 3) When the brightness is adjusted to the level desired, stop pressing the  or  button and after three seconds the BRIGHTNESS window will disappear with the new adjustment saved.





**Smart Help** After the BRIGHTNESS window has disappeared, to continue to the CONTRAST window, follow the steps under CONTRAST.

#### CONTRAST

To adjust your screen's contrast, follow the steps below. Contrast is the difference between the light and dark areas on the screen. A 100% contrast is recommended.

- 1) Press the  or  button on the monitor. The CONTRAST window appears.





- 2) Press the  or  button to adjust the contrast.
- 3) When the contrast is adjusted to the level desired, stop pressing the  or  button and after three seconds the CONTRAST window will disappear with the new adjustment saved.



**Smart Help** After the CONTRAST window has disappeared, to continue to the MAIN CONTROLS, follow the steps under LANGUAGE

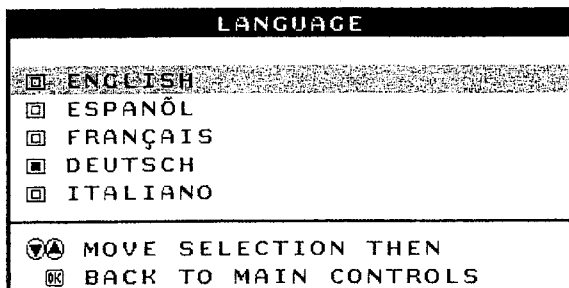
#### LANGUAGE


The ON SCREEN DISPLAY shows its settings in one of five languages. The default is English, but you can select French, Spanish, German, or Italian.

- 1) Press the  button on the monitor. The MAIN CONTROLS window appears. LANGUAGE should be highlighted.
- 2) Press the  button again. The LANGUAGE window appears.





- 3) Press the  or  button until the desired language is highlighted.



- 4) Press the  button to confirm your selection and return to MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted...

**Smart Help** After returning to MAIN CONTROLS...

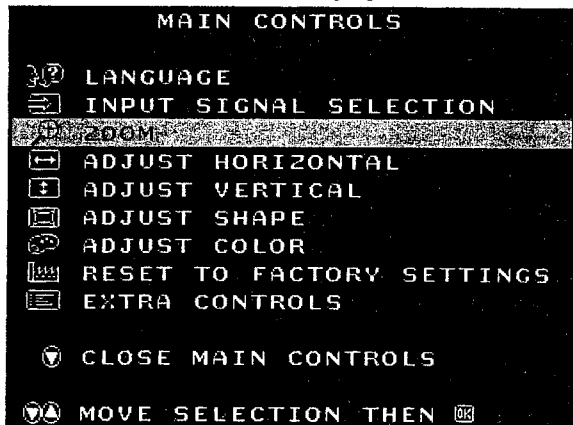
... to continue to INPUT SIGNAL SELECTION, press the  button until INPUT SIGNAL SELECTION is highlighted. Next, follow steps 3 - 5 under INPUT SIGNAL SELECTION.

... to exit completely, press  the button

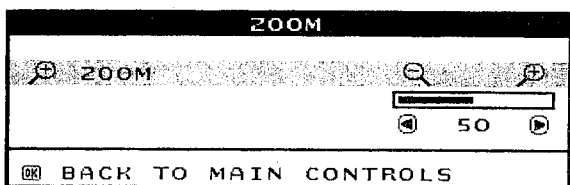
## ZOOM

ZOOM increases or decreases the size of the images on your screen. To adjust the ZOOM follow the steps below.

- 1) Press the \* button on the monitor. The MAIN CONTROLS window appears.
- 2) Press the ← button until ZOOM is highlighted.



- 3) Press the \* button. The ZOOM window appears.



- 4) Press the ← or → button to adjust ZOOM.
- 5) Press the \* button to confirm your selection and return to the MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.

Smart Help After returning to MAIN CONTROLS...

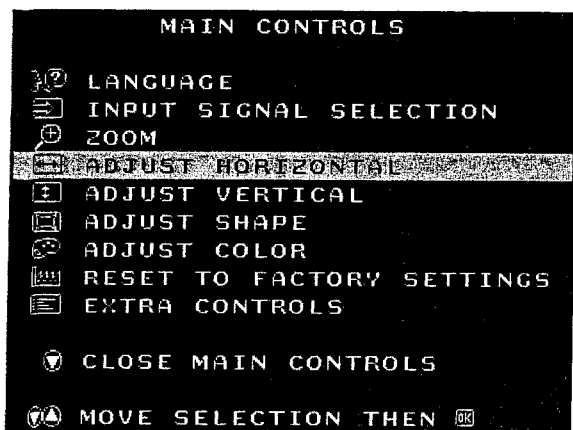
... to continue to ADJUST HORIZONTAL, press the → button until ADJUST HORIZONTAL is highlighted. Next, follow steps 3 - 7 under ADJUST HORIZONTAL.

... to exit completely, press the \* button

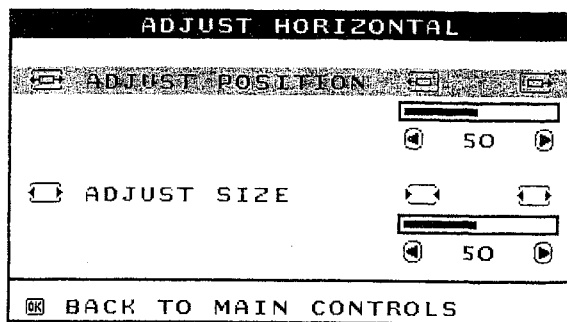
## ADJUST HORIZONTAL

ADJUST POSITION under ADJUST HORIZONTAL shifts the image on your screen either to the left or right. Use this feature if your image does not appear centered. ADJUST SIZE under ADJUST HORIZONTAL expands or controls the image on your screen, pushing it out toward the left and right sides or pulling it in toward the center.

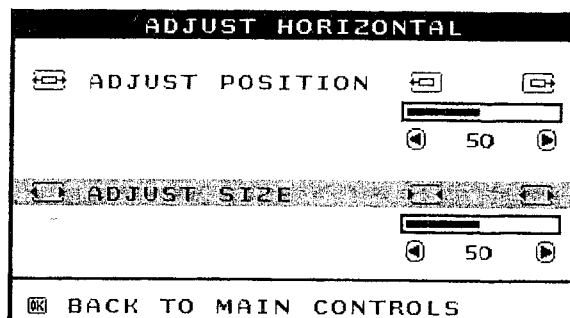
- 1) Press the \* button on the monitor. The MAIN CONTROLS window appears.
- 2) Press the → button until ADJUST HORIZONTAL is highlighted.



- 3) Press the \* button. The ADJUST HORIZONTAL window appears. ADJUST POSITION should be highlighted.



- 4) Press the ← or → button to move the image to the left or right.
- 5) When the position is adjusted, press the \* button to return to MAIN CONTROLS window, or press the → to highlight ADJUST SIZE.



- 6) To adjust the horizontal size, press the ← or → button.
- 7) When the size is adjusted, press the \* button to return to MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.

Smart Help

After returning to MAIN CONTROLS...

... to continue to ADJUST VERTICAL, press the → button until ADJUST VERTICAL is highlighted. Next, start with step 3 under ADJUST VERTICAL and follow the directions.

... to exit completely, press the \* button

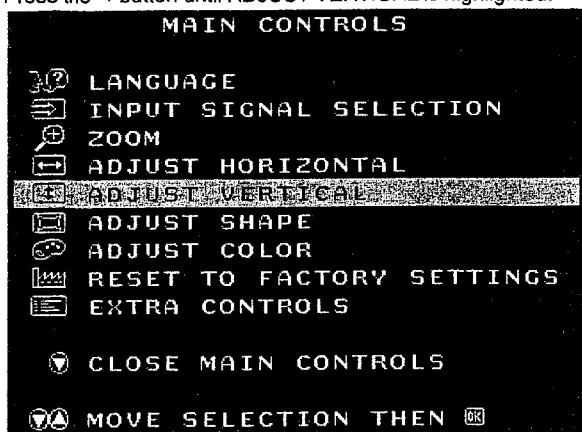
## ADJUST VERTICAL

ADJUST POSITION under ADJUST VERTICAL shifts the image on your screen either up or down. Use this feature if your image does not appear centered. ADJUST SIZE under ADJUST VERTICAL expands or controls the image on your screen, pushing it out toward the top or bottom or pulling it in toward the center.

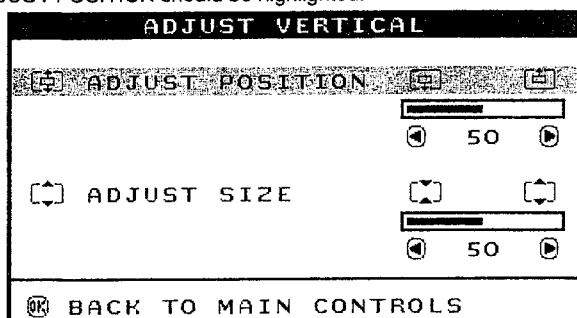
- 1) Press the \* button on the monitor. The MAIN CONTROLS window appears.

# OSD Adjustments

- 2) Press the **\*** button until ADJUST VERTICAL is highlighted.

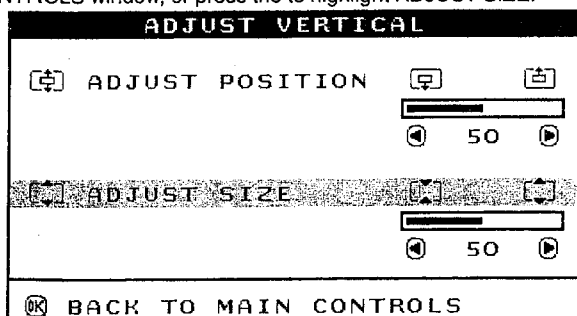


- 3) Press the **\*** button. The ADJUST VERTICAL window appears. ADJUST POSITION should be highlighted.



- 4) Press the **↑** or **↓** button to move the image up or down.

- 5) When the position is adjusted, press the **\*** button to return to MAIN CONTROLS window, or press the **→** button to highlight ADJUST SIZE.



- 6) To adjust the vertical size, press the **←** or **→** button.

- 7) When the size is adjusted, press the **←** button to return to MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.

Smart Help After returning to MAIN CONTROLS...

... to continue to ADJUST SHAPE, press the **→** button until ADJUST SHAPE is highlighted. Next, start with step 3 under ADJUST SHAPE and follow the directions.

... to exit completely, press the **\*** button

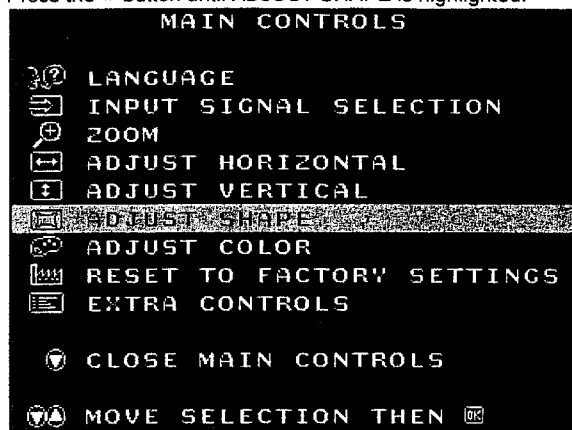
ADJUST SHAPE

ADJUST SIDE CURVE

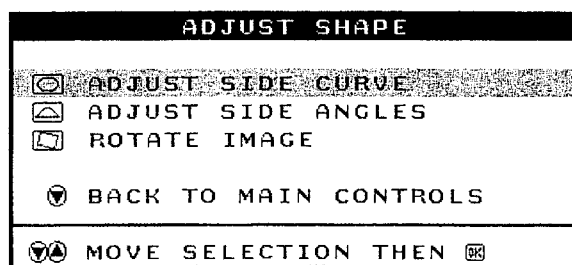
ADJUST SIDE CURVE under ADJUST SHAPE allows you to adjust two of the five preset options. These two options are PINCUSHION and BALANCED pincushion. Note: use these features only when the picture is not square.

- 1) Press the **\*** button on the monitor. The MAIN CONTROLS window appears.

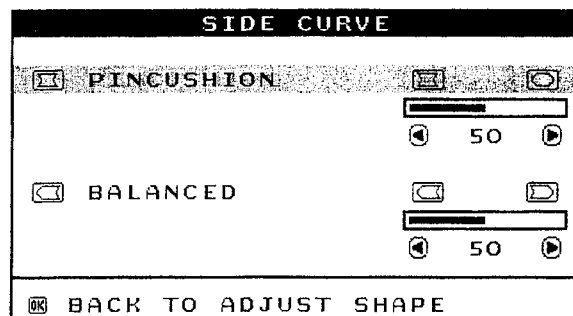
- 2) Press the **→** button until ADJUST SHAPE is highlighted.



- 3) Press the **\*** button. The ADJUST SHAPE window appears. ADJUST SIDE CURVE should be highlighted.

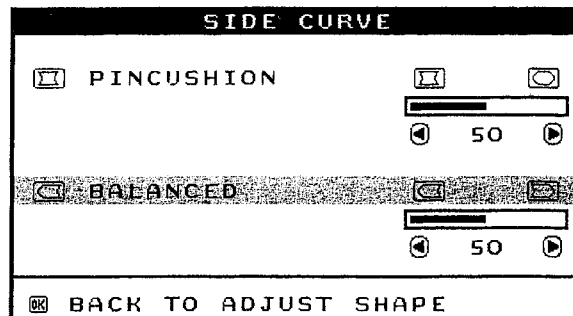


- 4) Press the **\*** button. The SIDE CURVE window appears. PINCUSHION should be highlighted.



- 5) To adjust the pincushion, press the **←** or **→** button.

- 6) When the pincushion is adjusted, press the **\*** button to highlight BALANCED or press the **\*** button to return to the ADJUST SHAPE window.



- 7) To adjust the balanced pincushion, press the **←** or **→** button.

- 8) When the balanced pincushion is adjusted, press the **\*** button to return to the ADJUST SHAPE window. BACK TO MAIN WINDOWS will be highlighted.

- 9) Press the **\*** button to return to the MAIN CONTROLS window, or press the **→** button until ADJUST SIDE ANGLES is highlighted.

Smart Help After returning to MAIN CONTROLS ...

...to continue to ADJUST SIDE ANGLES, start with step 5 under ADJUST SIDE ANGLES and follow the directions.

...to exit completely, press the button twice.

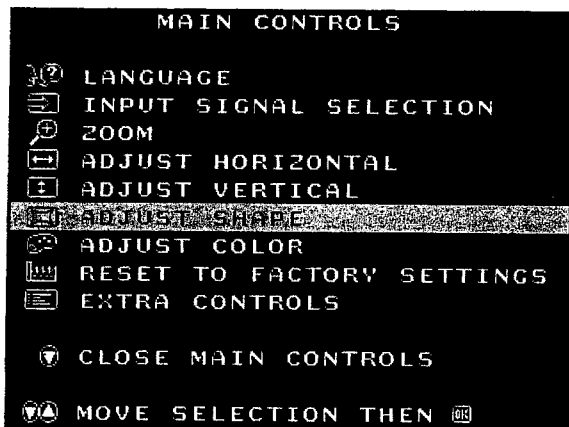
...to adjust only the BALANCED pincushion, follow steps 1 - 4 above, then press the button, and follow steps 7 - 9.

...to adjust only the PARALLELOGRAM, follow steps 1 - 4 above, then press the button, and follow steps 7 - 9

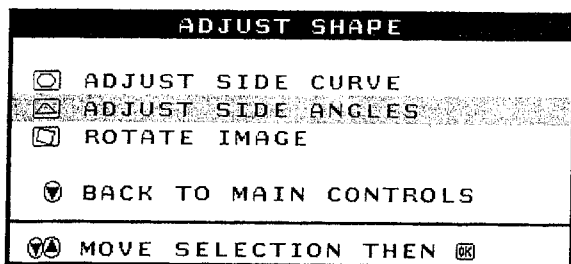
## ADJUST SIDE ANGLES

ADJUST SIDE ANGLES under ADJUST SHAPE allows you to adjust two of the five preset options. These two options are TRAPEZOID and PARALLELOGRAM. Note: use these features only when the picture is not square.

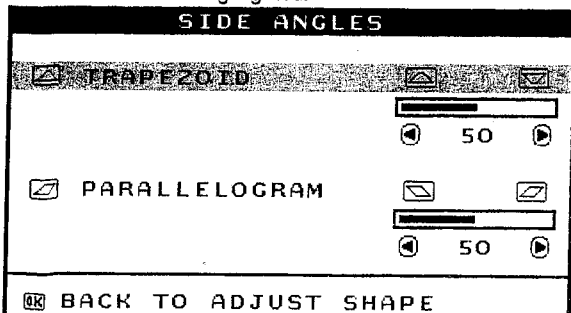
- 1) Press the button on the monitor. The MAIN CONTROLS window appears.
- 2) Press the button until ADJUST SHAPE is highlighted.



- 3) Press the button. The ADJUST SHAPE window appears. ADJUST SIDE CURVE should be highlighted.

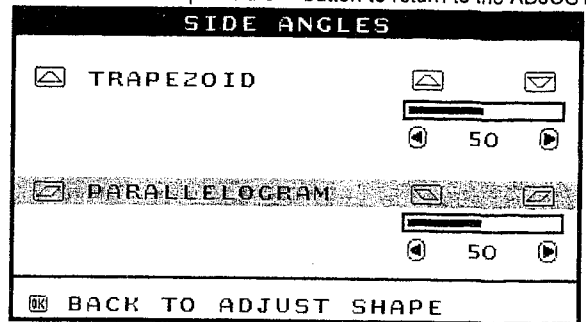


- 4) Press the button to highlight ADJUST SIDE ANGLES.
- 5) Press the button. The SIDE ANGLES window appears. TRAPEZOID should be highlighted.



- 6) To adjust the trapezoid, press the or button. SHAPE window.

- 7) When the trapezoid is adjusted, press the button to highlight PARALLELOGRAM or press the button to return to the ADJUST



- 8) To adjust the parallelogram, press the or button.
- 9) When the parallelogram is adjusted, press the button to return to the ADJUST SHAPE window. BACK TO MAIN WINDOWS will be highlighted.
- 10) Press the button to return to the MAIN CONTROLS window, or press the button until ROTATE IMAGE is highlighted.

Smart Help After returning to MAIN CONTROLS ...

...to continue to ROTATE IMAGE, start with step 5 under ROTATE IMAGE and follow the directions.

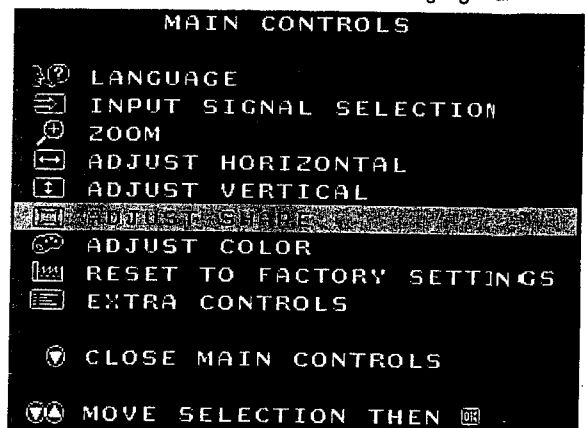
...to exit completely, press the button twice.

...to adjust only the PARALLELOGRAM, follow steps 1 - 4 above, then press the button, and follow steps 7 - 9

## ROTATE IMAGE

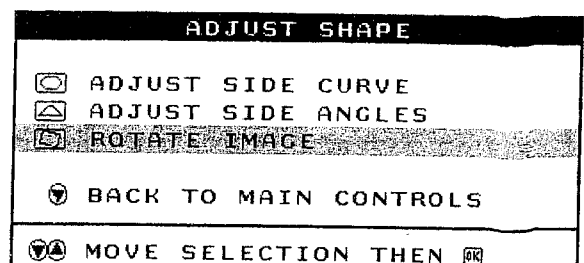
ROTATE IMAGE under ADJUST SHAPE allows you to adjust one of the five preset options. These two options are PINCUSHION and BALANCED pincushion. Note: use this feature only when the picture is not square.

- 1) Press the button on the monitor. The MAIN CONTROLS window appears.
- 2) Press the button until ADJUST SHAPE is highlighted.



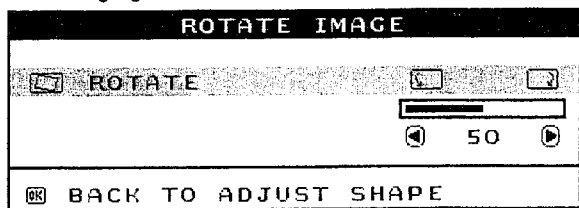
- 3) Press the button. The ADJUST SHAPE window appears. ADJUST SIDE CURVE should be highlighted.

- 4) Press the arrow until ROTATE IMAGE is highlighted



## OSD Adjustments (Continued)

5) Press the **⌂** button. The ROTATE IMAGE window appears. ROTATE should be highlighted.



6) To adjust the rotation, press the **⬅** or **➡** button.

7) When the rotation is adjusted, press the **⌂** button to return to the ADJUST SHAPE window. BACK TO MAIN CONTROLS should be highlighted.

8) Press the **⌂** button to return to MAIN CONTROLS.

Smart Help After returning to MAIN CONTROLS...

... to continue to ADJUST COLOR, press the **➡** button until ADJUST COLOR is highlighted. Next, start with step 3 under ADJUST COLOR and follow the directions.

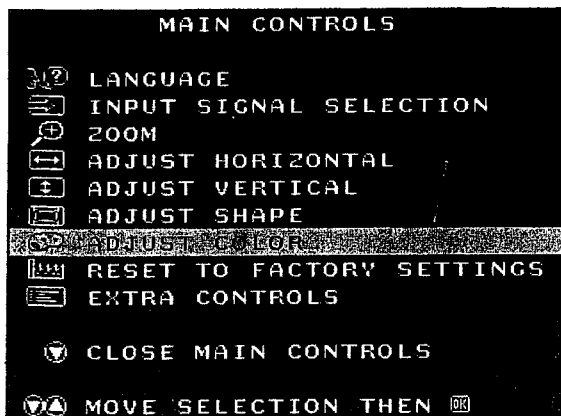
...to exit completely, press the **⌂** button twice.

## ADJUST COLOR

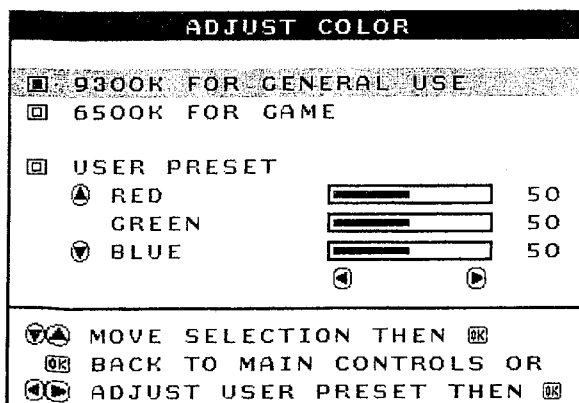
Your monitor has two preset options you can choose from. The first option is for GENERAL USE, which is fine for most applications. The second option is for GAMES, which is for playing computer games. When you select one of these options, the monitor automatically adjusts itself to that option. There is also a third option, USER PRESET, which allows you to adjust the colors on your screen to a setting you desire.

1) Press the **⌂** button on the monitor. The MAIN CONTROLS window appears.

2) Press the **➡** button until ADJUST COLOR is highlighted.

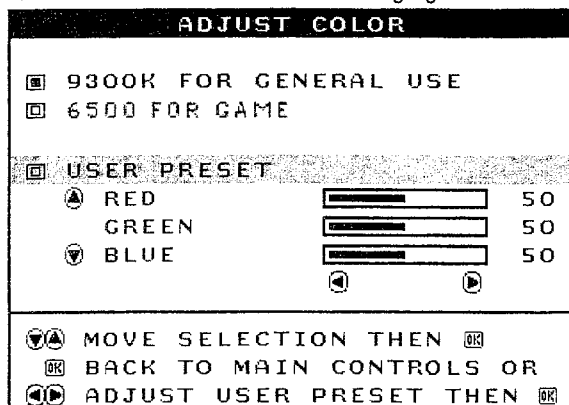


3) Press the **⌂** button. The ADJUST COLOR window appears.



4) Press the **⬅** or **➡** button to highlight 9300K for GENERAL USE, 6500K for GAMES, or USER PRESET.

5) Once you have highlighted GENERAL USE or GAMES, press the **⌂** button to confirm your selection and return to the MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.



6a) If USER PRESET is highlighted, press the **➡** button to highlight RED. Next, press the LEFT CURSOR or RIGHT CURSOR button to adjust the color red.

6b) When finished with RED, press the **➡** button to highlight GREEN. Next, press the **⬅** or **➡** button to adjust the color green.

6c) When finished GREEN, press the **➡** button to highlight BLUE. Next, press the **⬅** or **➡** button to adjust the color blue.

6d) When all adjustments are complete, press the **⌂** button to confirm your adjustments and return to the MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.

Smart Help After returning to MAIN CONTROLS...

... to continue to RESET TO FACTORY SETTINGS, press the **⬅** button until RESET TO FACTORY SETTINGS is highlighted. Next, start with step 3 under RESET TO FACTORY SETTINGS.

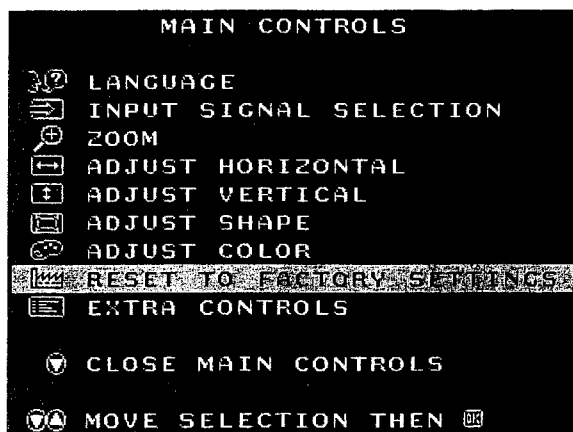
... to exit completely, press the **⌂** button.

## RESET TO FACTORY SETTINGS

RESET TO FACTORY SETTINGS returns everything in all the windows to factory presets.

1) Press the **⌂** button on the monitor. The MAIN CONTROLS window appears.

2) Press the **⬅** button until RESET TO FACTORY SETTINGS is highlighted.



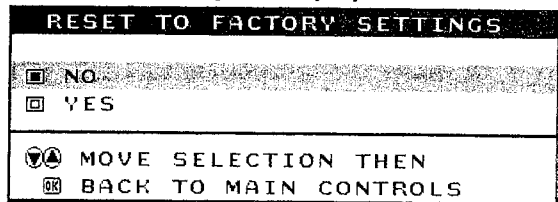
3) Press the **⌂** button. The RESET TO FACTORY SETTINGS window appears.



## OSD Adjustments (Continued)

13

- 4) Press the  $\leftarrow$  or  $\rightarrow$  button to select YES or NO. NO is the default. YES returns all settings to their original factory adjustments.



- 5) Press the  $\rightarrow$  button to confirm your selection and return to the MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted.

Smart Help After returning to MAIN CONTROLS...

... to continue to EXTRA CONTROLS, press the  $\rightarrow$  button until EXTRA CONTROLS is highlighted. Next, start with step 3 under EXTRA CONTROLS.

... to exit completely, press the  $\rightarrow$  button.

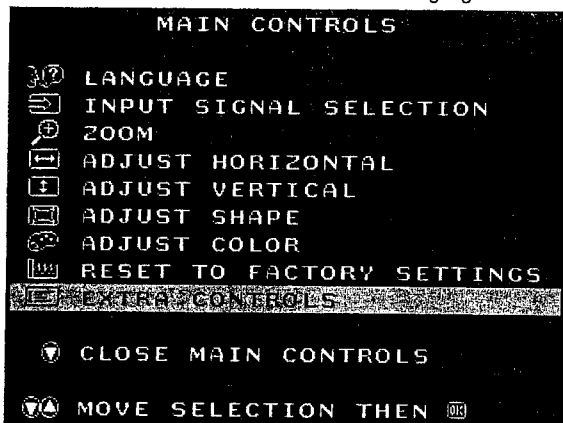
### EXTRA CONTROLS

#### DEGAUSS

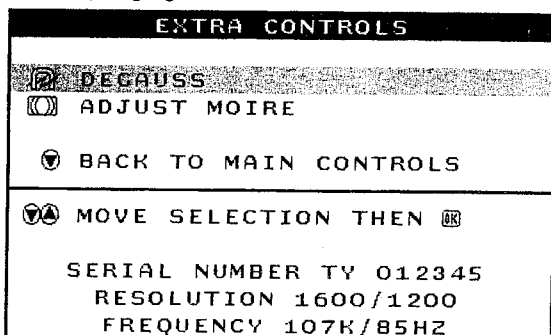
EXTRA CONTROLS is a set of three features, including DEGAUSS. Degaussing removes electromagnetic build up that may distort the color on your screen.

- 1) Press the  $\rightarrow$  button on the monitor. The MAIN CONTROLS window appears.

- 2) Press the  $\rightarrow$  button until EXTRA CONTROLS is highlighted.



- 3) Press the  $\rightarrow$  button. The EXTRA CONTROLS window appears. DEGAUSS will be highlighted.



- 4) To degauss your screen, press the  $\rightarrow$  button. Your screen will be degaussed, then the MAIN CONTROLS window will reappear. CLOSE MAIN CONTROLS will be highlighted.

Smart Help After returning to MAIN CONTROLS...

... to continue to ADJUST MOIRE, press the  $\rightarrow$  button until EXTRA CONTROLS is highlighted. Next, start with step 3 under EXTRA CONTROLS, ADJUST MOIRE.

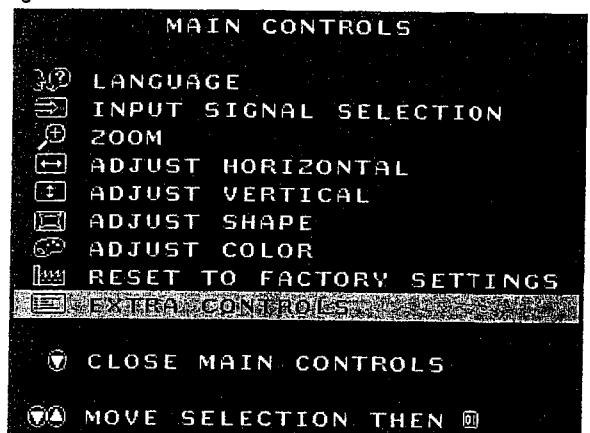
... to exit completely, press the  $\rightarrow$  button.

### ADJUST MOIRE

EXTRA CONTROLS is a set of three features, including ADJUST MOIRE. Moire is a fringe pattern arising from the interference between two superimposed line patterns. To adjust your moire, follow the steps below. Note: Use only if necessary. By activating ADJUST MOIRE, sharpness can be affected.

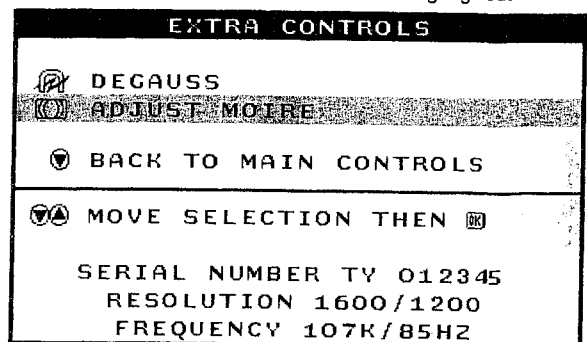
- 1) Press the  $\rightarrow$  button on the monitor. The MAIN CONTROLS window appears.

- 2) Press the DOWN CURSOR button until EXTRA CONTROLS is highlighted.

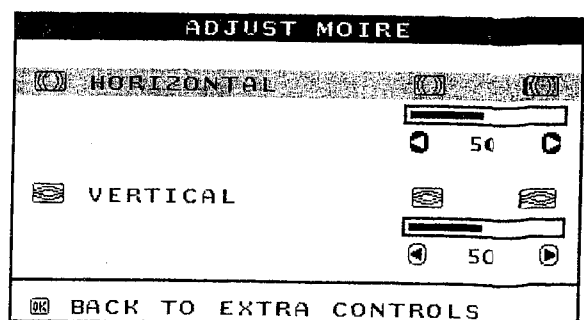


- 3) Press the  $\rightarrow$  button. The EXTRA CONTROLS window appears. DEGAUSS will be highlighted.

- 4) Press the  $\rightarrow$  button until ADJUST MOIRE is highlighted.



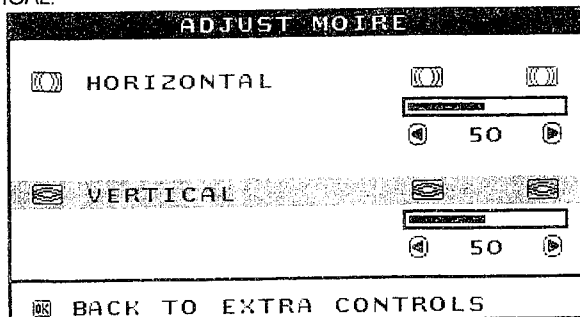
- 5) Press the  $\rightarrow$  button. The ADJUST MOIRE window appears. HORIZONTAL will be highlighted.



- 6) To adjust the horizontal moire, press the  $\leftarrow$  or  $\rightarrow$  button

## OSD Adjustments (Continued)

7) When the horizontal moire is adjusted, press the button to highlight VERTICAL.



8) To adjust the vertical moire, press the or button.

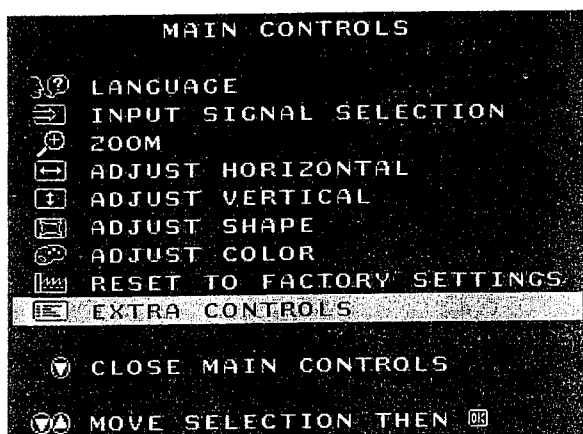
9) When the vertical moire is adjusted, press the button to return to the EXTRA CONTROLS window. BACK TO MAIN CONTROLS will be highlighted.

### AUTO CALIBRATE

EXTRA CONTROLS is a set of three features, including AUTO CALIBRATE. Auto Calibrate regularly readjusts the color to its original value for any of the ADJUST COLOR selections, including USER PRESET. AUTO CALIBRATE also adjusts the luminance and black level of the monitor, so that all three items remain at original settings. This helps extend the useful life of the monitor. The calibration process takes less than 6 seconds to complete.

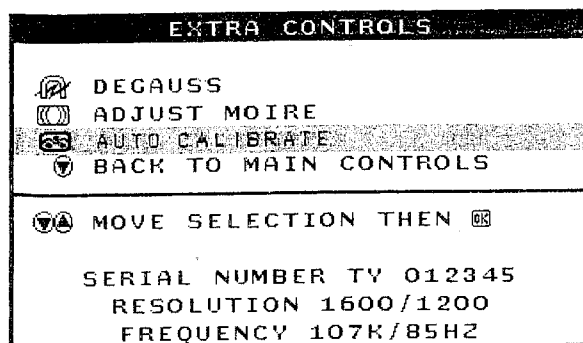
1) Press the button on the monitor. The MAIN CONTROLS window appears.

2) Press the button until EXTRA CONTROLS is highlighted.

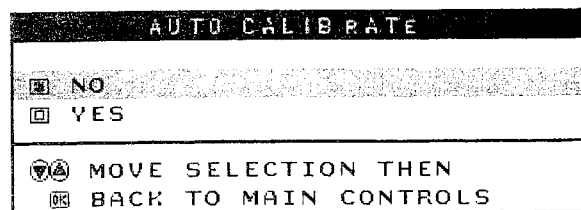


3) Press the button. The EXTRA CONTROLS window appears. DEGAUSS will be highlighted.

4) Press the button until AUTO CALIBRATE is highlighted.



5) Press the button to select ON or OFF.



6) When the selection is made, press the button to confirm your selection and return to the MAIN CONTROLS window. CLOSE MAIN WINDOW will be highlighted.

7) Press the button to exit the MAIN CONTROLS window.

After returning to MAIN CONTROLS...

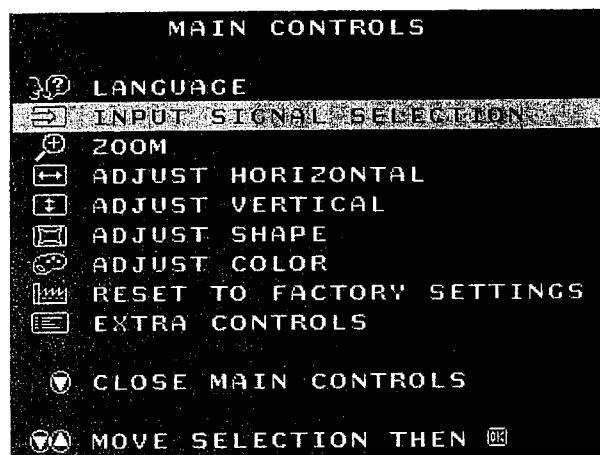
... to exit completely, press the button.

### INPUT SIGNAL SELECTION

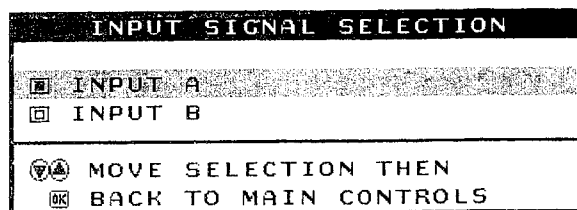
INPUT SIGNAL SELECTION determines what you see on the screen. The default setting is INPUT A, but if the video input signal is different than the output signal, you may want to change it to INPUT B.

1) Press the button on the monitor. The MAIN CONTROLS window appears.

2) Press the button until INPUT SIGNAL SELECTION is highlighted.



3) Press the button. The INPUT SIGNAL SELECTION window appears.

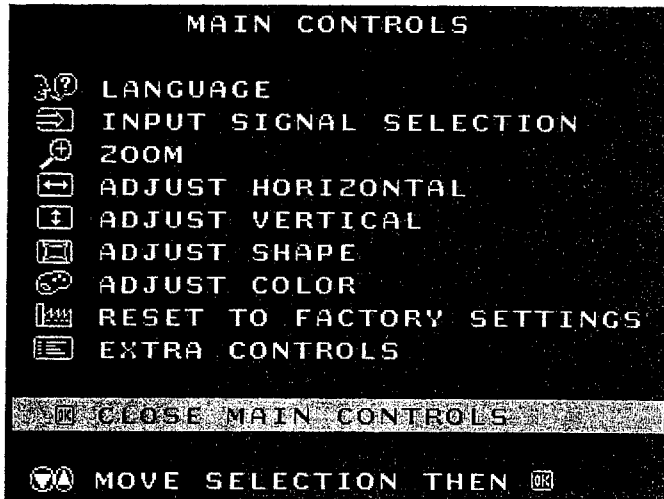


4) Press the button to highlight INPUT B or INPUT A.


5) Press the button to confirm your selection and return to the MAIN CONTROLS window. CLOSE MAIN CONTROLS will be highlighted. After returning to MAIN CONTROLS...

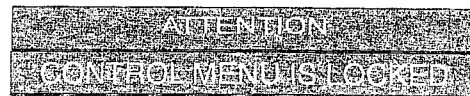
After returning to MAIN CONTROLS to exit completely, press the  button.

CLOSE MAIN CONTROLS




To lock (disable) OSD function:

- Press OSD button " " for over 15 seconds to lock the OSD function. Release it, then OSD comes on the screen as below.




To unlock (enable) OSD function:

- Press OSD button " " for over 10 seconds again to unlock the OSD function. Release it, then OSD comes on the screen as below.

Disable/Enable all the WARNING SIGNAL & Access Service mode (burn in mode) :

To disable all the WARNING SIGNAL :



- Disconnect the Interface cable of the monitor (Monitor is ON.).
- Press OSD button " " for over 15 seconds to disable all the WARNING SIGNAL. Then release the "OSD" button.
- If it is successful, then the signal " NO SIGNAL INPUT " disappeared to enter power saving-off mode.

To enable all the WARNING SIGNAL :

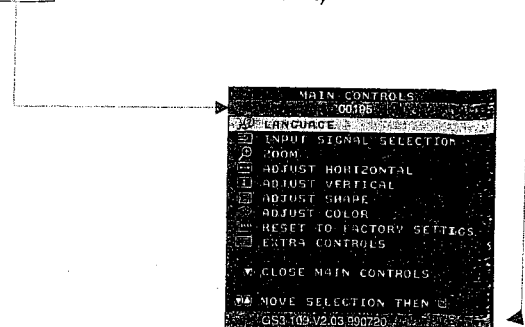
- After disconnect the Interface cable of the monitor, then Monitor is powered ON.
- If it is successful, the signal " NO SIGNAL INPUT " comes on the screen again later.




Access Service Mode & Burn in mode

Firstly, get into Factory Adjustment Mode.

Push LEFT  & RIGHT  buttons at the same time for over 15 seconds and release them.

The factory message appears at the bottom of the main OSD menu. (for example : GS3 109 V2.03 990720; 00195 is M.T.B.F. in HOUR unit)



- Disconnect the Interface cable of the monitor.
- Push LEFT  & RIGHT  buttons at the same time, then power ON.
- If it is successful, the signal "  " comes on the screen later. (Background is white.)

Leave "burn in MODE" :

- Reconnect the interface cable to PC, then the "burn in MODE" disappear.

## 0. Location of the panel

0.1 Main panel (1160)

0.2 Video panel (1162)

## 1. General

To be able to perform measurements and repairs on the "circuit boards", the monitor should be placed in Service Position (fig. 1) first:

*How to remove the back cover of monitor :*

There are 2 screws in the lid [1 screw are at the right side of the monitor, The other 1 screw are at the left side of the monitor], to fix the front cabinet and back cover of the monitor.

Step 1: To open the lid at the right-upper side and 1 screw in right-downer side of the monitor.(FIG.3)

Step 2: To open the lid at the left-upper side and 1 screw in left-downer side of the monitor.(FIG.4)

Step 3: To remove the backcover, you can see FIG.5

Step 4: To remove the 16 screws on the metal shield, and remove the metal shield, you can see FIG.6.

### Chassis :

- After remove the back cover & metal shield, you can see the inside of the monitor as Fig. 6.
- To remove 13 screws for service position as Fig. 6 to Fig. 8.
- Include remove bottom plate screw, then slide out chassis board and disconnect metal shield.

### Video panel :

- After remove the metal frame (Fig. 5), to remove the metal shield on rear side of Video panel for measurement.

### Main panel :

After remove the metal frame.

- To cut out cable tie and disconnect "video panel"
- To disconnect EHT cable
- To disconnect ground wire(1703) of video board.
- To disconnect M1311(4pin) to control panel.
- To disconnect M1501(4pin) yoke connector.
- To disconnect M1131(2pin) degaussing coil
- To slide out Main panel as Fig. 1.

### Service position :

To get service position as Fig. 1 through Fig. 2 to Fig. 8.

## 2. Repair instructions

After the service position was obtained, all the panel's copper track side could be accessed.

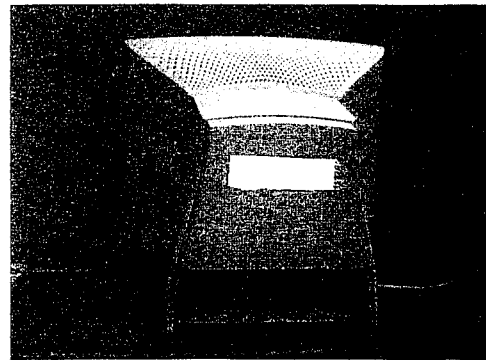


Fig. 2

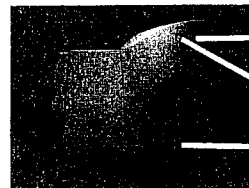


Fig. 3

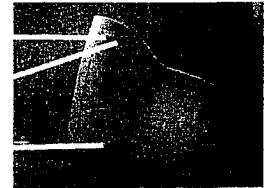


Fig. 4

screws  
lids  
screws



Fig. 5

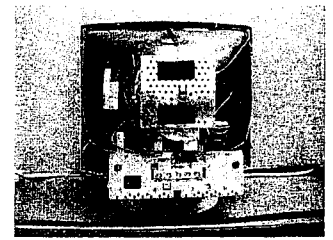


Fig. 6

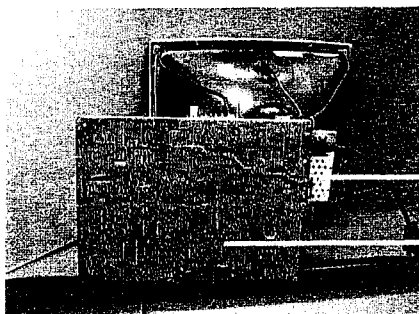


Fig. 1 Service Position

1162

1160

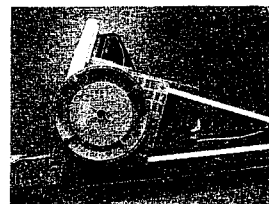


Fig. 7

screw

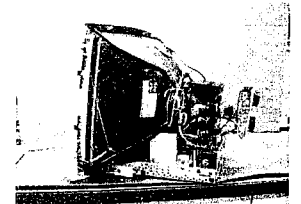



Fig. 8

## 1. Safety Instructions for Repairs

1.1 Safety regulations require that during a repair:

- The set should be connected to the mains via an isolating transformer.
- Safety components, indicated by the symbol , should be replaced by components identical to the original ones.
- When replacing the CRT, safety goggles must be worn.

1.2 Safety regulations require also that after a repair:

- The set should be returned in its original condition.
- The cabinet should be checked for defects to avoid touching, by the customer, of inner parts.
- The insulation of the mains lead should be checked for external damage.
- The mains lead strain relief should be checked on its function.
- The cable form and EHT cable are routed correctly and fixed with the mounted cable clamps in order to avoid touching of the CRT, hot components or heat sinks.

\* Thermally loaded solder joints should be checked and resoldered where necessary. This includes components like LOT, the line output transistor, fly-back capacitor.

## 2. Maintenance Instructions

It is recommended to have a maintenance inspection carried out periodically by a qualified service employee. The interval depends on the usage conditions.

- During the maintenance inspection the above mentioned "safety instructions for repair" should be carried out. The power supply and deflection circuitry on the chassis, the CRT panel and the neck of the CRT should be cleaned.

When cleaning the monitor on the outside:

- Always disconnect the monitor from the mains.
  - Always use a damp AND NOT WET lint-free cloth.
  - To clean the screen, apply a household glass cleaner to a cloth and then wipe the screen.
  - Do not use solvents or abrasives on the monitor.
- It might discolour the cabinet and/or affect the anti glare treatment on your screen.

## 3. Warnings

3.1 In order to prevent damage to ICs and transistors, all high-voltage flash-overs must be avoided. In order to prevent damage to the picture tube, the method shown in Fig 3.1 should be used to discharge the picture tube. Use a high-voltage probe and a multimeter (position DC-V). Discharge until the meter reading is 0V (after approx 30s).

### 3.2 ESD

All ICs and many other semiconductors are sensitive to electrostatic discharges (ESD). Careless handling during repair can drastically shorten the life. Make sure that during repair you are connected by a pulse band with resistance to the same potential as the earth of the unit. Keep components and tools also at this same potential.

3.3 Be careful when taking measurements in the high-voltage section

and on the picture tube panel.

3.4 Never replace modules or other components while the unit is switched on.

3.5 When making settings, use plastic rather than metal tools. This will prevent any short-circuit and the danger of a circuit becomes unstable.

3.6 After repair the wiring should be fastened once more in the cable clamps for this purpose.

3.7 Together with the deflection unit the picture tube is used as an integrated unit. Adjustment of this unit during repair is therefore not recommended.

## 4. Notes

The semiconductors indicated in the circuit diagram(s) and in the parts lists are completely interchangeable per position with the semiconductors in the unit, irrespective of the type indication on these semiconductors.

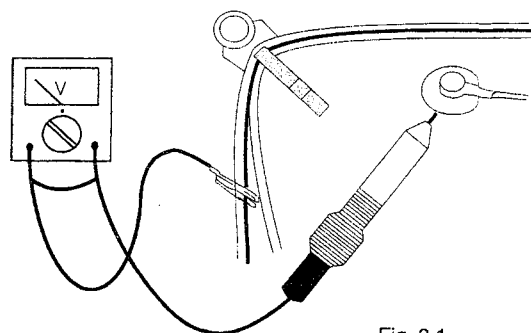


Fig. 3.1

## DDC DATA

\*\*\*\*\*  
HTCGS3.chk  
\*\*\*\*\*

## Vendor/Product Identification

ID Manufacturer Name : PHL  
ID Product Code : 207A(HEX.)  
ID Serial Number : 123456(DEC.)  
Week of Manufacture : 35  
Year of Manufacture : 1999

## EDID Version, Revision

Version : 1  
Revision : 2

## Basic Display Parameters/Features

Video Input Definition : Analog Video Input  
0.700V/0.000V (0.70Vpp)  
without Blank-to-Black Setup  
Separate Sync  
Composite Sync  
without Sync on Green  
no Serration required

Maximum H Image Size : 41 cm  
Maximum V Image Size : 31 cm  
Display Transfer Characteristic: 2.66  
(gamma)

Feature Support (DPMS) : Standby  
Suspend  
Active Off

Display Type : RGB color display

## Color Characteristics

Red X coordinate : 0.625  
Red Y coordinate : 0.34  
Green X coordinate : 0.285  
Green Y coordinate : 0.605  
Blue X coordinate : 0.15  
Blue Y coordinate : 0.065  
White X coordinate : 0.283  
White Y coordinate : 0.298

## Established Timings

Established Timings I : 720 x 400 @70Hz (VGA,IBM)  
640 x 480 @60Hz (VGA,IBM)  
640 x 480 @72Hz (VESA)  
640 x 480 @75Hz (VESA)  
800 x 600 @60Hz (VESA)  
Established timings II : 800 x 600 @72Hz (VESA)  
800 x 600 @75Hz (VESA)  
832 x 624 @75Hz (Mac II)  
1024 x 768 @60Hz (VESA)  
1024 x 768 @70Hz (VESA)  
1024 x 768 @75Hz (VESA)  
1280 x 1024 @75Hz (VESA)

Manufacturer's timings : 1152 x 870 @75Hz (Mac II)

## Standard Timing Identification #1

Horizontal active pixels : 1920  
Aspect Ratio : 4:3  
Refresh Rate : 60

## Standard Timing Identification #2

Horizontal active pixels : 1792  
Aspect Ratio : 4:3  
Refresh Rate : 75

## Standard Timing Identification #3

Horizontal active pixels : 1600  
Aspect Ratio : 4:3  
Refresh Rate : 75

## Standard Timing Identification #4

Horizontal active pixels : 1280  
Aspect Ratio : 5:4  
Refresh Rate : 85

## Standard Timing Identification #5

Horizontal active pixels : 1280  
Aspect Ratio : 5:4  
Refresh Rate : 60

## Standard Timing Identification #6

Horizontal active pixels : 1024  
Aspect Ratio : 4:3  
Refresh Rate : 85

## Detailed Timing #1

Pixel Clock (MHz) : 229.5  
H Active (pixels) : 1600  
H Blanking (pixels) : 560  
V Active (lines) : 1200  
V Blanking (lines) : 50  
H Sync Offset (F Porch) (pixels): 64  
H Sync Pulse Width (pixels) : 192  
V Sync Offset (F Porch) (lines): 1  
V Sync Pulse Width (lines) : 3  
H Image Size (mm) : 392  
V Image Size (mm) : 294  
H Border (pixels) : 0  
V Border (lines) : 0  
Flags : Non-interlaced  
Normal Display, No stereo  
Digital Seperate Sync  
Positive V Sync  
Positive H Sync

## Monitor Descriptor #2

Serial Number : TY 123456

## Monitor Descriptor #3

Monitor Name : Philips 201B

## Monitor Descriptor #4

Min. Vt rate Hz : 50  
Max. Vt rate Hz : 160  
Min. Horiz. rate kHz : 30  
Max. Horiz. rate kHz : 107  
Max. Supported Pixel : Not specified

## Extension Flag

: 0

## Check sum

: 78(hex)

\*\*\*\*\*  
EDID data for HTC CRT  
\*\*\*\*\*

0: 00 1: ff 2: ff 3: ff 4: ff 5: ff 6: ff 7: 00  
8: 41 9: 0c 10: 7a 11: 20 12: 40 13: e2 14: 01 15: 00  
16: 23 17: 09 18: 01 19: 02 20: 6c 21: 29 22: 1f 23: a6  
24: e8 25: 00 26: b9 27: a0 28: 57 29: 49 30: 9b 31: 26  
32: 10 33: 48 34: 4c 35: ad 36: ef 37: 80 38: d1 39: 40  
40: c1 41: 4f 42: a9 43: 4f 44: 81 45: 99 46: 81 47: 80  
48: 61 49: 59 50: 45 51: 59 52: 31 53: 59 54: a6 55: 59  
56: 40 57: 30 58: 62 59: b0 60: 32 61: 40 62: 40 63: c0  
64: 13 65: 00 66: 88 67: 26 68: 11 69: 00 70: 00 71: 1e  
72: 00 73: 00 74: 00 75: ff 76: 00 77: 20 78: 54 79: 59  
80: 20 81: 20 82: 31 83: 32 84: 33 85: 34 86: 35 87: 36  
88: 0a 89: 20 90: 00 91: 00 92: 00 93: fc 94: 00 95: 50  
96: 48 97: 49 98: 4c 99: 49 100: 50 101: 53 102: 20 103: 32  
104: 30 105: 31 106: 42 107: 0a 108: 00 109: 00 110: 00 111: fd  
112: 00 113: 32 114: a0 115: 1e 116: 6b 117: ff 118: 00 119: 0a  
120: 20 121: 20 122: 20 123: 20 124: 20 125: 20 126: 00 127: 78

# DDC Instructions

19

There are two chips (IC) to store the serial number of monitor as below.

DDC IC (with EDID data)  
OSD IC (EEPROM)

To write the serial number of monitor to DDC IC and OSD IC simultaneously.

Please follow the indications as below.

- Access the factory mode of monitor.
- Execute DDCV2A F0.EXE
- Follow DDC instructions to write serial number to DDC IC and OSD IC.
- Turn off monitor (leave factory mode).
- Press OSD button, select MONITOR STATUS, verify the updated serial number of monitor.

To access factory mode:

- Turn off monitor (don't turn off PC)
- Hold " " and " " simultaneously on the front control panel, then press " ", wait till the OSD menu with characters "factory mode (below OSD menu)" come on the screen of monitor as shown in Fig. 1.

- If OSD menu disappears on the screen of monitor, press " " again (anytime), then the OSD menu comes on the screen again.
- using " " , " " : to select OSD menu.

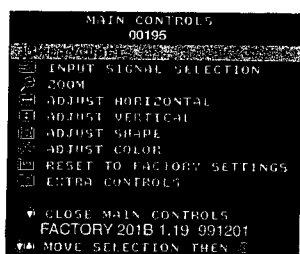
" " , " " : to increase or decrease the setting.

- Using " " to confirm the selection.

To leave factory mode

- \* After alignment of factory mode, turn off monitor (if you do not turn off monitor, the OSD menu is always at the factory mode), then turn on monitor again (at this moment, the OSD menu goes back to user mode).

Fig 1



## DDC Instructions

This [DDC Module (DDC cable)= 4822 320 12004(=4822 724 27550)] and

[DDC V2(DDCV2A .EXE) software(3.5" disk)=3138 106 10065 ] are used for "BU Monitor - Chungli product range" which incorporates a DDC1/DDC2B function that allows

bi-directional communication between the monitor and PC system for optimal video configuration. [January 31 2000, Revision 3.3] , which upgrades the software and service information(4822 727 21027 & 4822 727 21038) , is fully compatible with previous one (DDCV2A F0.EXE).

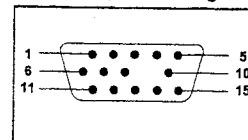
Additional information :

Additional information about DDC (Display Data Channel) may be obtained from Video Electronics Standards Association (VESA).

Extended Display Identification (EDID) information may be also be obtained from VESA.

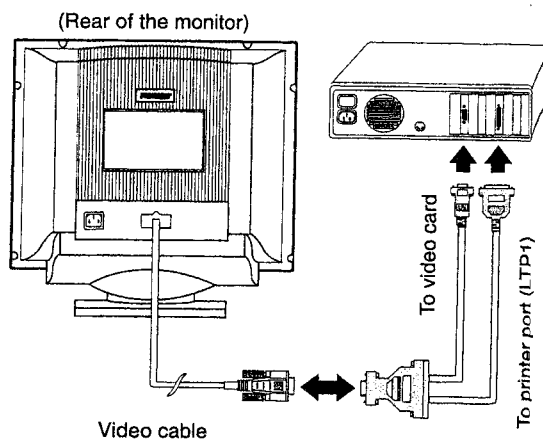
Pin assignment

The 15-pin D-sub connector (male) of the signal cable (3 rows) for DDC feature :



Pin No.	Assignment	Pin No.	Assignment
1	Red video input	9	No pin
2	Green video input	10	Logic ground
3	Blue video input	11	Connected to pin 10
4	Connected to pin 10	12	Serial data line (SDA)
5	Ground	13	H.sync/H+V
6	Red video ground	14	V. sync (VCLK for DDC)
7	Green video ground		
8	Blue video ground	15	Data clock line(SCL)

Connection



DDC data re-programming

### 1. General

In case the DDC data memory IC, replaced due to a defect the data contents of this IC have to be re- programmed via a PC. In case of replacement of the video (or deflection) board it is advised to re-soldered DDC IC from the old board onto the new board, in this case the IC dose not need to be re-programmed.

### 2. DDCV2A.EXE can be used for : EDID Structure Version/Revision

Version	: 1	
Revision	: 0	(text file)

and

Version	: 1	
Revision	: 2	(.hex file)

## DDC Reprogramming Instructions

### System Requirements

DDC Module (DDC cable), P/N = 4822 320 12004  
 An Intel 386 (or above) PC or compatible  
 DOS 6.0 or above  
 DDCV2A.EXE software

### Procedure

Connect DDC Cable between PC and Monitor.

Turn on Monitor and PC.

Access Factory Mode of monitor.

Verify Factory Mode by OSD function of monitor.

Insert diskette in Drive a: Select Run "DDCV2A F0(Zero).EXE"  
 under DOS or Win. (hit the space bar "once")

Verify the data and version of DDC application software.

It should be : January 31 2000  
 Revision 3.3

Press "Enter" at the introduction screen

### Menu Configuration:

File	R/W	Setup	Quit
Load EDID	Write EDID to EEPROM	Options	
Load txt file (V1.0)	Read From EEPROM	Barcode format	
Save EDID	Edit EDID Code		
Save txt File	Auto Scan		
Convert EDID Code			
Os shell			
Exit			

### General :

#### 1. How to change drive

- Use arrow keys to highlight "Options" under the Setup menu, press "Enter".
- Press "F2", then press "ESC", fill in "A" or "C".  
 [(If your .HEX files for different Model numbers in drive "A", then fill in "A").,  
 (If your .HEX files for different Model numbers in drive "C", then fill in "C").  
 Normally, to read DDC data from EEPROM of Monitor is enough.]
- Press "Enter", then press "ESC"

#### 2. How to select .HEX files for different Model numbers example:

- Use arrow keys to highlight "Load EDID" under the File menu, press "Enter"
- Bring up  press "Enter"
- Bring up  ← select, press "Enter"
- Bring up  at this highlight area, press "Enter", then go back to last screen  
 ← select for 201B10/00(HTC CRT)

## How to write DDC hex files to Monitor

- Use arrow keys to highlight "Options" under the Setup menu, press "Enter"
- Tab down to ID Serial Number, use down arrow key to place the asterisk (\*) beside "store in DEC with LSB first". Press "control/enter" to save.  
 (Ensure the top asterisk (\*) is beside in store in HEX with LSB first.)
- Use arrow keys to highlight "Load EDID" under the file menu, press "Enter".
- Use arrow keys to highlight  Press "Enter".
- Use arrow keys to highlight "the model list under subdirect", press "Enter".
- Use arrow keys to highlight "Write EDID to EEPROM" under the R/W menu, press "Enter".
- Use arrow keys to highlight "Read from EEPROM" under the R/W menu, press "Enter".
- Use arrow keys to highlight "Edit EDID Code" under the R/W menu, press "Enter".
- Verify the ID Serial number on the screen matches the serial number of the unit.
- Verify EDID Structure Version is "Version :2, Revision :1"
- Press "ESC"
- Use arrow keys to highlight "Quit", Press "Enter".

### Menu Configuration:

File	R/W	Setup	Quit
Load EDID	Write EDID to EEPROM	Options	
Load txt file (V1.0)	Read From EEPROM	Barcode format	
Save EDID	Edit EDID Code		
Save txt File	Auto Scan		
Convert EDID Code			
Os shell			
Exit			



## How to change the Year, Week & Serial number of Monitor models]

① Use arrow keys to highlight "Barcode format", under the Setup menu, press "Enter".

② Bring up : Barcode example : 9925123456  
Barcode format : YYWWSSSSSS

← Fill in 9925123456, press "Enter"

← Fill in YYWWSSSSSS, press "Enter"

③ continued: Barcode example : 9925123456  
Barcode format : YYWWSSSSSS

---

Manufacture Year : 1999      press "space"  
Manufacture Week : 25  
Serial No. : 123456  
Serial No. ASCII : TY 123456

---

EDID [16] Week : 19  
EDID [17] Year : 09 [Year-1990]  
EDID [12..15] : 0001e240  
EDID [77 -89] : TY ☐☐☐☐☐☐  
data correct ? (Y/N) Y

Factory code for each site is as below.

Brazil H C (48h,43h)  
Chungli T Y (54h,59h)  
Delta G K(47h,48h)  
Juarez Y A(59h,41h)  
Shenzshen C X(43h,58h)  
Suzhou BZ (42h,5Ah)  
Szombathely HD (48h,44h)

← Fill in "Y", don't press "Enter"

There is a description at the lower of the screen for Barcode format as below.

Barcode format : Y,W,S,X,- (year,week,s/no,ignore,fixed)

Y stands for "year".  
W stands for "week".  
S stands for "s/no (serial number)".  
X stands for "ignore". Allow user to fill in any 'character' or 'numeric'.  
- stands for "fixed". User have to fill in Special 'character' or 'numeric' for "AutoScan" if user fill in '-' at "Barcode format :".

④ Use arrow keys to highlight "Auto Scan" under the R/W menu, press "Enter".

⑤ Bring up: Auto Scan ☐☐☐☐☐☐☐☐ ← year, week, serial number can be changed.

☐ Serial Number  
☐ Year Code  
☐ Week Code  
★ don't care

(If monitor is not at Factory Mode, access Factory Mode at this moment.)

⑥ Fill in "Barcode data (for instance: 9925123456)" beside AutoScan, press "Enter".  
After 10 seconds around, bring up:

File	R/W	Setup	Quit
Write EDID to EEPROM			
Read From EEPROM		<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	
Edit EDID Code		<input type="checkbox"/>	
Auto Scan		<input type="checkbox"/>	
		<input type="checkbox"/>	
		★	
Factory writing ...100% (58) (f8) (7f) (12).			

⑦ Press "ESC" "ESC", return to R/W menu.

⑧ Select "Edit EDID code", press "Enter".

⑨ Verify "ID Serial No." .....

Turn off monitor, then turn on monitor again.

① Press OSD button, select "MONITOR STATUS", press ☐ ☐ button again.

② Verify "SERIALNO".

(Leave OSD function).

③ Use arrow keys to highlight "QUIT", press "Enter".

## DDC Instructions (Continued)

### How to change the Year, Week & Serial number of Monitor models]

① Use arrow keys to highlight "Barcode format", under the Setup menu, press "Enter".

② Bring up : Barcode example : 993412345678  
Barcode format : YYWWSSSSSSSS

← Fill in 993412345678, press "Enter"

← Fill in YYWWSSSSSSSS, press "Enter"

③ continued:

Barcode example	:	993412345678	
Barcode format	:	YYWWSSSSSSSS	
-----			
Manufacture Year	:	1999	press "space"
Manufacture Week	:	34	
Serial No.	:	12345678	
Serial No. ASCII	:	TY 12345678	
=====			
EDID [16] Week	:	22	
EDID [17] Year	:	09 [Year-1990]	
EDID [12..15]	:	00bc614e	
EDID [77-89]	:	TY	□□□□□□
data correct ? (Y/N) Y			

Factory code for each site is as below.

Brazil	H C (48h,43h)
Chungli	T Y (54h,59h)
Delta	G K(47h,4Bh)
Juarez	Y A(59h,41h)
Shenzshen	C X(43h,58h)
Suzhou	BZ (42h,5Ah)
Szombathely	HD (48h,44h)

← Fill in "Y", don't press "Enter"

There is a description at the lower of the screen for Barcode format as below.

Barcode format : Y,W,S,X,- (year,week,s/no,ignore,fixed)

Y stands for "year".

W stands for "week".

S stands for "s/no (serial number)".

X stands for "ignore". Allow user to fill in any 'character' or 'numeric'.

- stands for "fixed". User have to fill in Special 'character' or 'numeric' for "AutoScan" if user fill in '-' at "Barcode format :".

④ Use arrow keys to highlight "Auto Scan" under the R/W menu, press "Enter".

⑤ Bring up: Auto Scan

◇◇△△□□□□□□

← year, week, serial number can be changed.

□ Serial Number  
◇ Year Code  
△ Week Code  
★ don't care

(If monitor is not at Factory Mode, access Factory Mode at this moment.)

⑥ Fill in "Barcode data (for instance: 993412345678)" beside AutoScan, press "Enter".  
After 10 seconds around, bring up:

File	R/W	Setup	Quit
Write EDID to EEPROM			
Read From EEPROM			
Edit EDID Code			
Auto Scan			
◇◇△△□□□□□□			
□			
◇			
△			
★			
Factory writing: ...100% (58) (f8) (7f) (12).			

⑦ Press "ESC" "ESC", return to R/W menu.

⑧ Select "Edit EDID code", press "Enter".

⑨ Verify "ID Serial No." .....

Turn off monitor, then turn on monitor again.

① Press OSD button, select "MONITOR STATUS", press OSD button again.

② Verify "SERIALNO".

(Leave OSD function).

③ Use arrow keys to highlight "QUIT", press "Enter".

## 0. General

When carry-out the electrical settings in many cases a video signal must be applied to the monitor. A computer with :

- ATI GPT-1600 (4822 397 10065), Mach 64 (up to 107kHz)

are used as the video signal source. The signal patterns are selected from the "service test software" package, see user guide 4822 727 21046 (GPT-1600).

0.1 This monitor has 35 factory-preset modes as below

31.469 KHz/70.087 Hz, 640 X 350	81.250 KHz/65.000 Hz, 1600 X 1200
31.469 KHz/59.941 Hz, 640 X 480	83.640 KHz/59.999 Hz, 1792 X 1344
31.468 KHz/70.084 Hz, 720 X 400	85.938 KHz/85.002 Hz, 1280 X 960
37.5 KHz/75 Hz, 640 X 480	86.333 KHz/59.995 Hz, 1856 X 1392
37.861 KHz/72.810 Hz, 640 X 480	87.500 KHz/70.000 Hz, 1600 X 1200
37.861 KHz/85.081 Hz, 640 X 350	90.000 KHz/60.000 Hz, 1920 X 1440
37.879 KHz/60.317 Hz, 800 X 600	91.146 KHz/85.024 Hz, 1280 X 1024
37.927 KHz/85.039 Hz, 720 X 400	93.750 KHz/75.000 Hz, 1600 X 1200
43.269 KHz/85.008 Hz, 640 X 480	106.250 KHz/85.00 Hz, 1600 X 1200
46.875 KHz/75.000 Hz, 800 X 600	106.270 KHz/74.997 Hz, 1792 X 1344
48.077 KHz/72.188 Hz, 800 X 600	
48.363 KHz/60.004 Hz, 1024 X 768	
49.722 KHz/74.546 Hz, 832 X 624	
50.628 KHz/100.10 Hz, 640 X 480	
53.674 KHz/85.061 Hz, 800 X 600	
56.476 KHz/70.069 Hz, 1024 X 768	
60.000 KHz/60.000 Hz, 1280 X 960	
60.023 KHz/75.029 Hz, 1024 X 768	
63.923 KHz/100.00 Hz, 800 X 600	
63.981 KHz/60.020 Hz, 1280 X 1024	
67.500 KHz/75.00 Hz, 1152 X 864	
68.677 KHz/84.997 Hz, 1024 X 768	
68.681 KHz/74.979 Hz, 1152 X 870	
71.809 KHz/76.15 Hz, 1152 X 900	
75.000 KHz/60.000 Hz, 1600 X 1200	
79.976 KHz/75.024 Hz, 1280 X 1024	

0.2 With normal VGA card:

If not using the ATI card during repair or alignment, The service engineer also can use this service test software adapting with normal standard VGA adaptor and using standard VGA mode 640 x 480, 31.5 kHz/60 Hz (only) as signal source.

0.3 AC/DC Measurement:

The measurements for AC waveform and DC figure is based on 640 x 480 31.5 kHz/60 Hz resolution mode with test pattern "gray scale".

Power input: 110V AC

### 1. B+ supply voltage (3157) 210Vdc

- Apply a video signal in the 1024 x 768 with 68.7 kHz/85Hz mode.
- Select the "cross-hatch" pattern.
- Set the brightness control and the contrast control to the minimum position.
- Pre-set trimming potentiometer 3157(B+) and 3698(EHT) in mid-position.
- Set Vg2 (screen) to fully Counter-clockwise (zero beamcurrent).
- Connect a dc voltmeter between the joint of capacitor 2154 and ground (common ground).
- Set the B+ trimming potentiometer 3157 so that the reading on the dc voltmeter is 210 V +/- 0.2 Vdc.

### 2. High-voltage EHT (3698)

- Apply a video signal in the 1024 x 768 with 68.7 kHz/85Hz mode.
- Select the "cross-hatch" pattern.
- Set the brightness control and the contrast control to the minimum position.
- Turn off the power.

- Connect a "high-voltage voltmeter" between the high-voltage connection of the picture tube and earth.
- Turn on the power.
- Set the EHT trimming potentiometer 3661 so that the "high-voltage voltmeter" reads 27.0 kV +/- 0.2 kV.
- Turn off the power.
- Remove the "high-voltage voltmeter" from the picture tube.
- Turn on the power again.

### 3. Monitor the following auxiliary voltages.

SOURCE ACROSS C2362	+ 8.0V +/- 0.5 VDC
SOURCE ACROSS C2143	+ 5.0V +/- 0.5 VDC
SOURCE ACROSS C2361	+ 12.0V +/- 0.5 VDC
SOURCE ACROSS C2134	+ 15.0V +/- 1.0 VDC
SOURCE ACROSS C2137	- 15.0V +/- 1.0 VDC
SOURCE ACROSS D6148	+ 6.3V +/- 0.5 VDC
SOURCE ACROSS C2131	+ 210.0V +/- 1.5 VDC
SOURCE ACROSS C2133	+ 82.7V +/- 2.0 VDC

### 4. General conditions for alignment

- 4.1 During all alignments, supply a distortion free AC mains voltage to set via an isolating transformer with low internal impedance.
- 4.2 Align in pre-warmed condition, at least 30 minutes warm-up with nominal picture brightness.
- 4.3 Purity, geometry and subsequent alignments should be carried out in magnetic cage with correct magnetic field.

Northern hemisphere : H=0, V=450+/-50 mG, Z=0  
 Southern hemisphere : H=0, V=-450+/-50 mG, Z=0  
 Equatorial Support : H=0, V=0 mG, Z=0

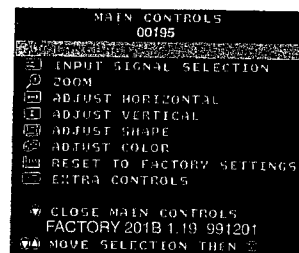
- 4.4 All voltages are to be measured or applied with respect to ground.

Note: Do not use heatsink as ground.

- 4.5 Adjust function controls " " to center position except for contrast control which should be set to MAX.

### 5. To access factory mode:

- Turn off monitor (don't turn off PC)
- Press " " and " " simultaneously on the front control panel, then press " ", wait till the OSD menu with characters " factory mode (below OSD menu)" come on the screen of monitor.



- If OSD menu disappears on the screen of monitor, press " " again (anytime), then the OSD menu comes on the screen again.
- using " " : to select OSD menu.
- using " " : to increase or decrease the setting.
- Using " " to confirm the selection.

## Electrical Adjustments (Continued)

### 6 To leave factory mode

- \* After alignment of factory mode, turn off monitor (if you do not turn off monitor, the OSD menu is always at the factory mode), then turn on monitor again (at this moment, the OSD menu goes back to user mode).

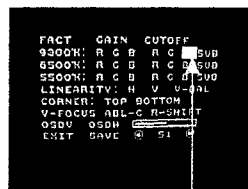


Fig. 2.2

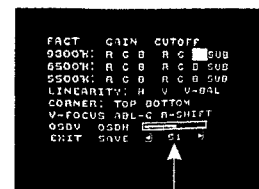


Fig. 2.3

### 7. Alignment of Vg2 cut-off point, white tracking (OSD control)

Equipment : 1. Video Test Generator-801GC (Quantum Data)  
2. Color-analyzer (Minolta CA-100)

Vg2 [(screen), at the bottom of the L.O.T.].

- \* Apply a video signal in the 1024 x 768 with 68.7 kHz/85 Hz mode, select the "full white pattern" (sizes 392 x 294 mm).
- \* Use color-analyzer (Minolta CA-100) to adjust cutoff and white uniformity.

OSD R/G/B cut-off and R/G/B gain can be accessed, with initial data:

9300°K

R cutoff = 30%, R gain = 70% (I'C)

G cutoff = 30%, G gain = 70% (I'C)

B cutoff = 30%, B gain = 70% (I'C)

6500°K

R cutoff = 30%, R gain = 70% (I'C)

G cutoff = 30%, G gain = 70% (I'C)

B cutoff = 30%, B gain = 70% (I'C)

5500°K

R cutoff = 30%, R gain = 70% (I'C)

G cutoff = 30%, G gain = 70% (I'C)

B cutoff = 30%, B gain = 70% (I'C)

Brightness = 50%, Sub-Contrast = 90%, ABL = 50% (I'C)

Step 1: To select the character "FACTORY MODE" as shown in Fig. 2.1, press " " to access the OSD menu for R/G/B gain & cutoff as shown in Fig. 2.2.

Step 2: Press " " for function selection as shown in Fig. 2.3.

Step 3: Use " " to increase or decrease the value as shown in Fig. 2.3.

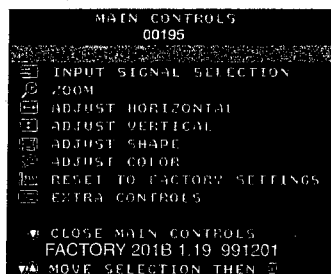


Fig. 2.1

BIAS R G B : R(red) G(green) B(blue) cutoff  
GAIN R G B : R(red) G(green) B(blue) gain  
V FOCUS : Vertical Focus  
H FOCUS : Horizontal Focus  
VLIN BAL : Vertical Linearity Balance  
USER : Horizontal size range  
RASTER H: Horizontal raster Shift  
RASTER V: Vertical raster Shift  
HLIN : Horizontal Linearity  
V LIN : Vertical Linearity  
SUB : Zoom Control range  
SUB : Sub Contrast  
V OFFSET : Vertical offset  
V GAIN : Vertical Gain  
ABL : Auto Beam Limit  
T CORNER: Corner Correction of TOP  
B CORNER: Corner Correction of BOTTOM

After pressing " ", then Press " "

7.1 Connect the video input, set brightness control at 50% and contrast at minimum position (OSD), Vg2 at Minimum (counter clockwise, and ABL (OSD) at 50% position. Slowly increase Vg2 voltage until light output is at 0.1 Ft-L +/- 0.01Ft-L (Y=0.1 Ft-L, on the screen of CA-100).

7.2 (The screen of monitor is dark now)  
: Press " " to show the OSD menu as shown in Fig. 2.1.  
: Select the character "FACTORY MODE" to access the R/G/B adjustment as shown in Fig. 2.2 and Fig. 2.3.  
: Adjust the cutoff of R/G/B to get 9300K (x=0.283 +/- 0.015, y=0.297 +/- 0.015), and brightness output at 0.07 +/- 0.01 Ft-L (Y=0.07Ft-L).

7.3 : Press " " to set contrast at maximum (100%).  
: Adjust gain of R/G/B to get 9300K (x=0.283 +/- 0.015, y=0.297 +/- 0.015, don't care about the Y value)

7.4 Apply a small white square 10 x 10 cm pattern, brightness set to center (50%), and contrast at maximum (100%), adjust Sub-contrast control (OSD) to reach 32 +/- 2 Ft-L.

7.5 Apply full white pattern at 9300K, adjust ABL (OSD) to reach 32 +/- 2 Ft-L (contrast at maximum 100%, brightness at center 50%).

7.6 : Select the 6500K colour temperature as shown in Fig. 2.2.

: Adjust the R/G/B cutoff and R/G/B gain as shown in procedure 7.2~7.3 to get

R/G/B cutoff  $x = 0.313 \pm 0.015$   
 $y = 0.329 \pm 0.015$

R/G/B gain  $x = 0.313 \pm 0.015$   
 $y = 0.329 \pm 0.015$   
 $Y = 28 \pm 1$  Ft-L (Adjust Sub-contrast control (OSD))

7.7 : Select the 5500K colour temperature as shown in Fig. 2.2.

: Adjust the R/G/B cutoff and R/G/B gain as shown in procedure 7.2~7.3 to get

R/G/B cutoff  $x = 0.332 \pm 0.015$   
 $y = 0.347 \pm 0.015$

R/G/B gain  $x = 0.332 \pm 0.015$   
 $y = 0.347 \pm 0.015$   
 $Y = 25 \pm 1$  Ft-L (Adjust Sub-contrast control (OSD))

## 8. Picture geometry setting (factory pre-set modes)

- Apply a video signal with cross-hatch pattern.
- Apply a video signal in the 1024 x 768 with 68.7 kHz/85 Hz mode.
- Set brightness and contrast controls to their center positions (OSD control).

### 8.1 Horizontal geometry (OSD control)

- Adjust the H-width to 392 mm
- Adjust the H-phase to center position.

### 8.2 Vertical geometry (OSD control)

- Adjust vertical size to 294 mm
- Adjust V-phase to center position.

### 8.3 Trapezoid distortion (OSD control)

- Adjust the trapezoid to get optimal vertical lines.

### 8.4 Pincushion (OSD control)

- Adjust the pincushion to get optimal vertical line.

### 8.5 Parallelogram (OSD control)

- Adjust parallelogram so that vertical lines are vertical or symmetrically about the center vertical axis.

### 8.6 Unbalance-pin (OSD control)

- Adjust the unbalance-pin so that that vertical border lines are aligned symmetrically.

### 8.7 Rotation (OSD control)

- Adjust picture so that vertical tilt is less than  $\pm 0.5$ mm.

### 8.8 Top/Bottom corner(control)

- Adjust the top/bottom corner control to get optimum corner geometry.

### 8.9 Store the preset results by selecting the "exit" (OSD control).

8.10 Repeat the procedure 8.1 to 8.9 until all the preset timings have been adjusted completely

## 9. Focus adjustment

: Apply a video signal in the 1024 x 768 with 68.7 kHz/85 Hz mode

: Select " @ " pattern.

: Set the brightness at center (50%) and the contrast to 22 FL.

: Adjust focus potentiometers (top of L.O.T.) Focus 1 for horizontal focus and Focus 2 for vertical focus so that the picture at 2/3 of the diagonal lines (from center to four corners) of the displayed screen is as sharp as possible.

**10. Loading DDC code** The DDC HEX data should be written into the DDC IC by EEPROM writer or equivalent method.

a: Service DDC Kit

DDC Module (DDC cable), Part number = 4822 320 12004  
 DDCV2A.EXE software (3.5" disk), Part number = 3138 106 10065

b: Please refer to Service information 4822 727 21 027(4822 727 21038) for using the Service DDC Kit.

## Electrical Adjustments (Continued)

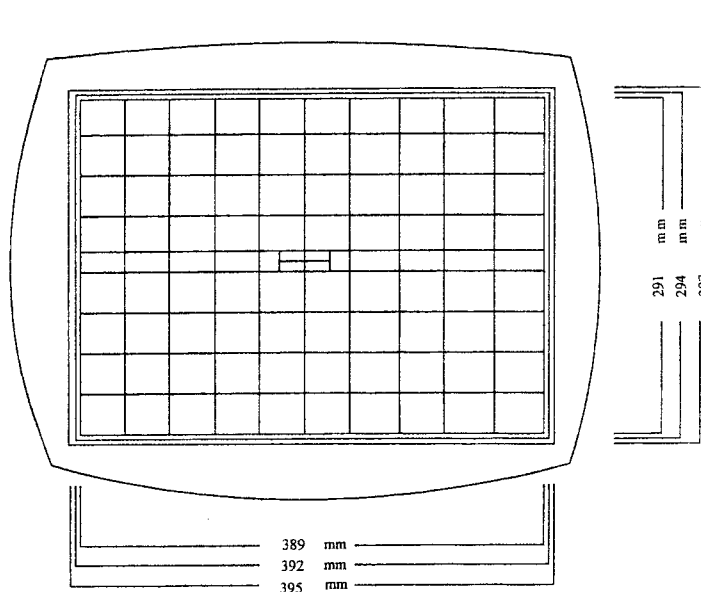
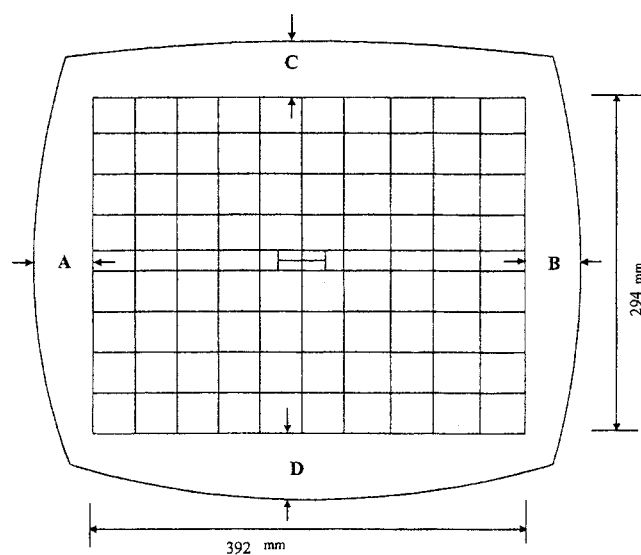
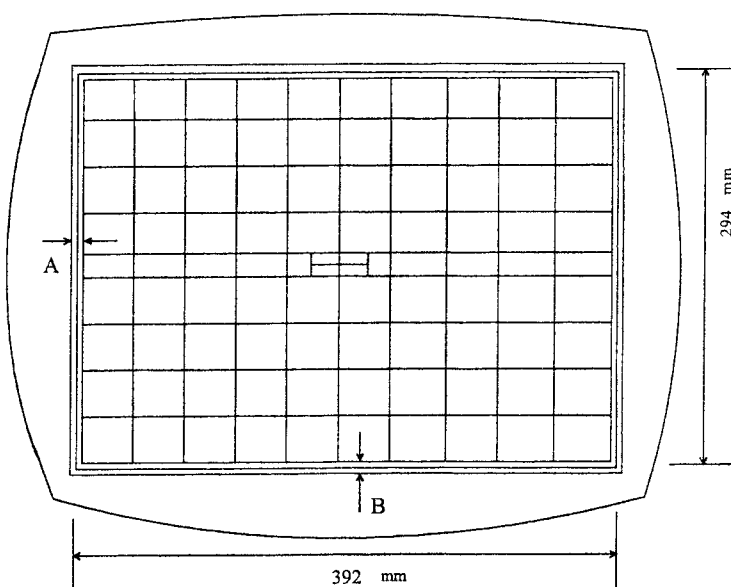


IMAGE DIMENSION


 $|A-B| \text{ AND } |C-D| < 6 \text{ mm}$   
IMAGE CENTERING


$$A = B = 2.5 \text{ mm}$$

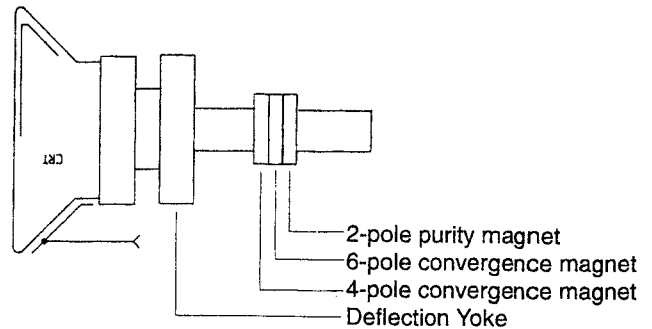
IMAGE GEOMETRY



CHARACTER FORMAT FOR FOCUS CHECK

## 1. Purity adjustment

- Make sure the monitor is not exposed to any external magnetic field.
- Produce a full red pattern on the screen, adjust the purity magnet rings on the PCM assy (on CRT) to obtain a complete field of the color red. This is done by moving the two tabs (2-pole) in such a manner that they advance in an opposite direction but at the same time to obtain the same angle between the two tabs, which should be approximately 180 degree.
- Check by full green pattern and full blue pattern again to observe their respective color purity.



## 2. Static convergence

### Introduction

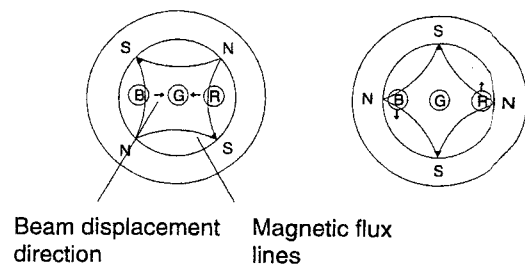
Slight deviation in the static convergence can be corrected by using two permanent pairs of magnets which are fitted around the neck of the CRT. These are the 4-pole magnet and the 6-pole magnet. The 4-pole magnet move the outermost electron beams (R and B) parallel in the opposite direction from the other. The 6-pole magnet moves the outermost electron beam (R, B and G) parallel in the opposite direction from the other. The magnetic field of the above magnets do not affect the center of the CRT neck.

### Setting

- Before the static convergence setting can be made, the monitor must be switched on for 30 minutes.
- The focus setting must be made correctly.
- Signal: 640 \* 480, 31.5 kHz/60 Hz mode.
- Set the tabs of the 4-pole magnet in the neutral position. This is when the tabs are opposite one another. In this position the magnets do not affect the deflection of the R and B electron beams.
- Set the tabs of the 6-pole magnet in the neutral position. This is when the tabs are opposite one another. In this position the magnets do not affect the deflection of the R, B, and G electron beams.
- First set the 4-pole magnet optimally.
- Then set the 6-pole magnet optimally.
- If the convergence is not now optimal, then adjust to the optimal setting with the 4-pole magnet and then with the 6- Pole magnet again.
- Set the tabs of the 6-pole magnet in the neutral position. This is when the tabs are opposite one another. In this position the magnets do not affect the deflection of the R, B, and G electron beams.
- First set the 4-pole magnet optimally.
- Then set the 6-pole magnet optimally.
- If the convergence is not now optimal, then adjust to the optimal setting with the 4-pole magnet and then with the 6- pole magnet again.

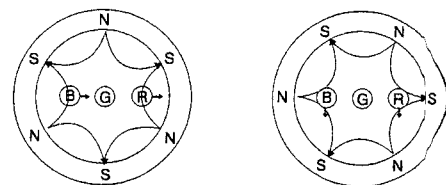
4-pole

Beam motion produced by the 4-pole convergence magnet



6-pole

Beam motion produced by the 6-pole convergence magnet



## Safety test requirements

All units that are returned for service or repair must pass the original manufactures safety tests. Safety testing requires both **Hipot** and **Ground Continuity** testing.

### HI-POT TEST INSTRUCTION

#### 1. Application requirements

- 1.1 All mains operated products must pass the Hi-Pot test as described in this instruction.
- 1.2 This test must be performed again after the covers have been refitted following the repair, inspection or modification of the product.

#### 2. Test method

##### 2.1 Connecting conditions

- 2.1.1 The test specified must be applied between the parallel-blade plug of the mains cord and all accessible metal parts of the product.
- 2.1.2 Before carrying out the test, reliable conductive connections must be ensured and thereafter be maintained throughout the test period.
- 2.1.3 The mains switch(es) must be in the "ON" position.

##### 2.2 Test Requirements

All products should be HiPot and Ground Continuity tested as follows:

Condition	HiPot Test for products where the mains input range is Full range(or 220V AC)	HiPot Test for products where the mains input is 110V AC(USA type)	Ground Continuity Test requirement
Test voltage	2820VDC (2000VAC)	1700VDC (1200VAC)	Test current: 25A, AC Test time: 3 seconds(min.) Resistance required: $\leq 0.09 + R$ ohm, R is the resistance of the mains cord.
Test time (min.)	3 seconds	1 second	
Trip current (Tester)	set at 100 uA for Max. limitation; set at 0.1 uA for Min. limitation	5 mA	
Ramp time	set at 2 seconds		

- 2.2.1 The test with AC voltage is only for production purpose, **Service center shall use DC voltage.**
- 2.2.2 The minimum test duration for Quality Control Inspector must be 1 minute. No breakdown during the test.
- 2.2.3 The test voltage must be maintained within the specified voltage + 5%.
- 2.2.4 The grounding blade or pin of mains plug must be conducted with accessible metal parts.

### 3. Equipments and Connection

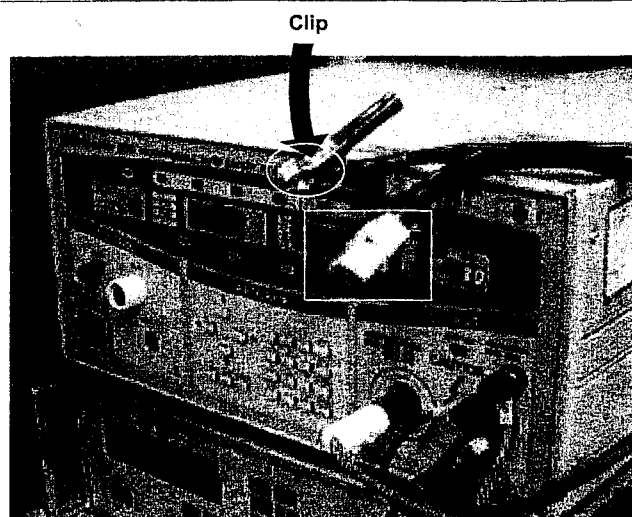
#### 3.1. Equipments

For example :

- ChenHwa 9032 PROGRAMMABLE AUTO SAFETY TESTER
- ChenHwa 510B Digital Grounding Continuity Tester
- ChenHwa 901 (AC Hi-pot test), 902 (AC, DC Hi-pot test) Withstanding Tester

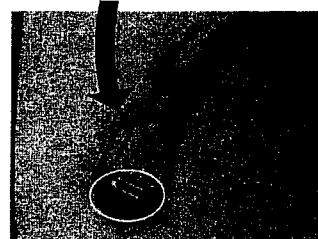
#### 3.2. Connection

- \* Turn on the power switch of monitor before Hipot and Ground Continuity testing.



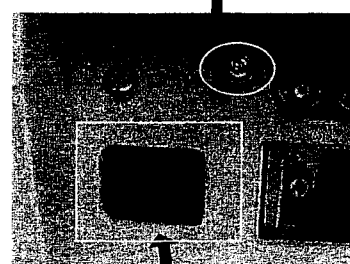
(ChenHwa 9032 tester)

Video cable



Connect the "video cable" or "grounding screw" to the CLIP on your tester.

Grounding screw



Connect the power cord to the monitor.

Power outlet

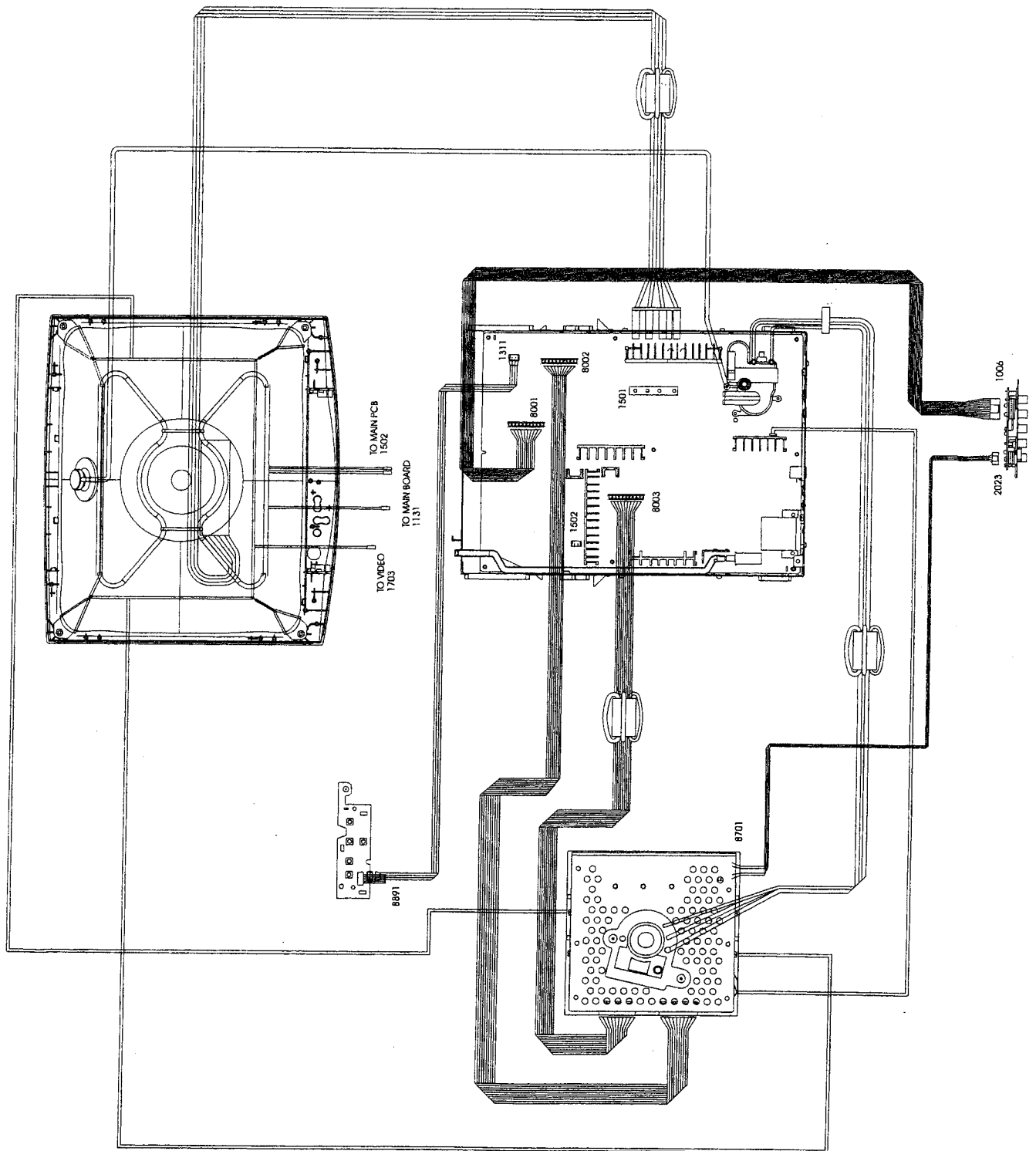
(Rear view of monitor)

### 4. Recording

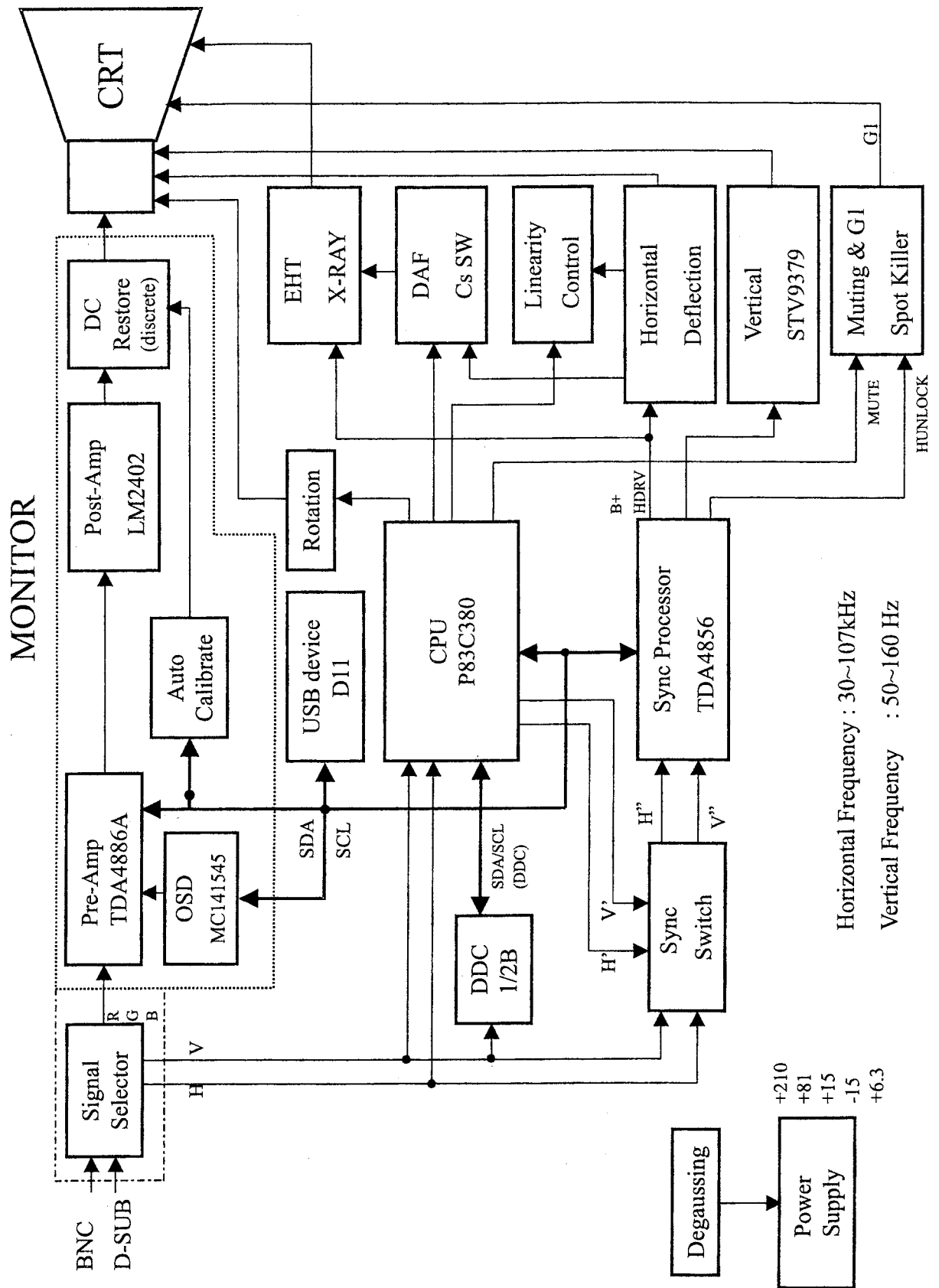
Hipot and Ground Continuity testing records have to be kept for a period of 10 years.



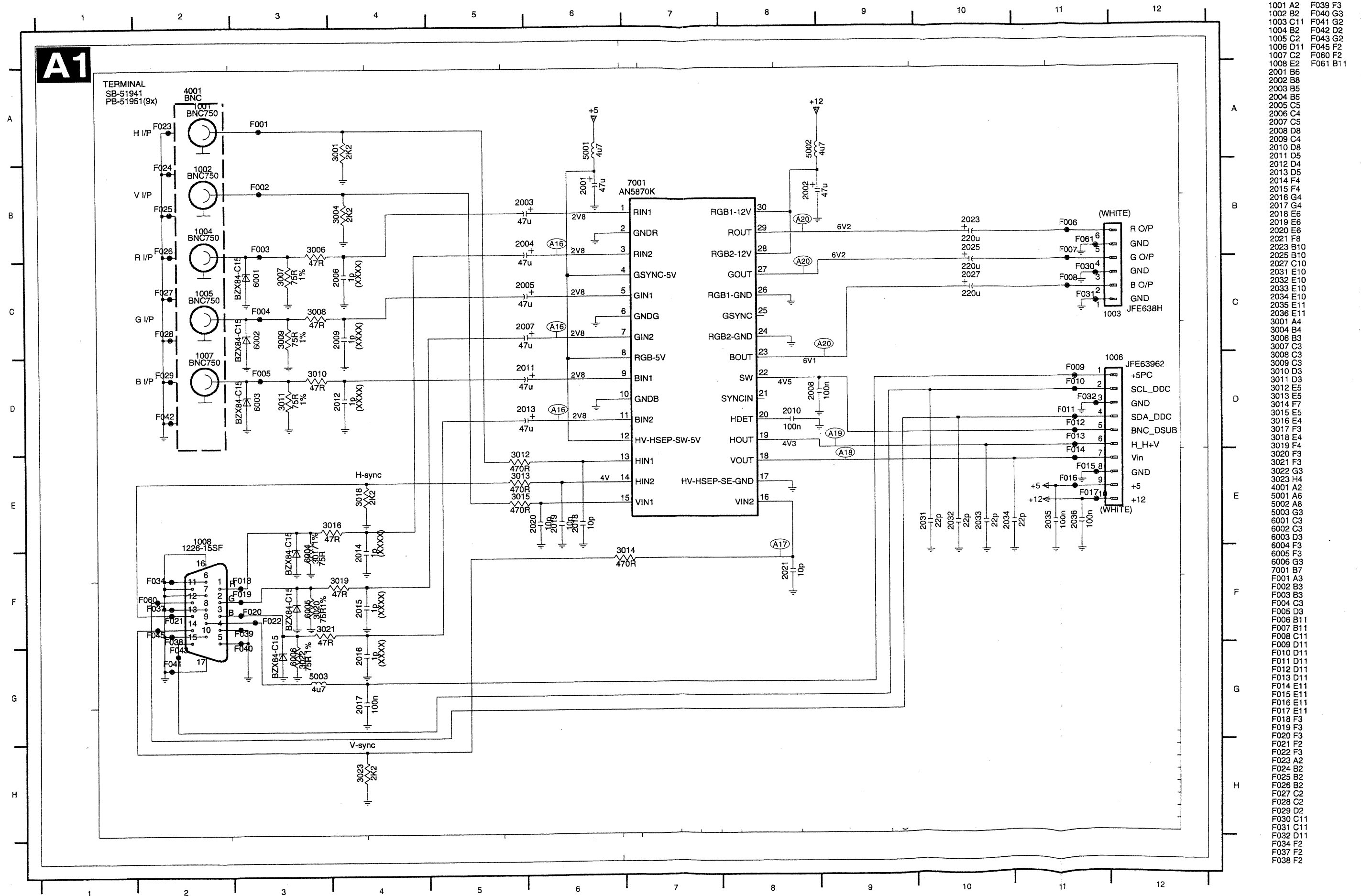
# Wiring Diagram

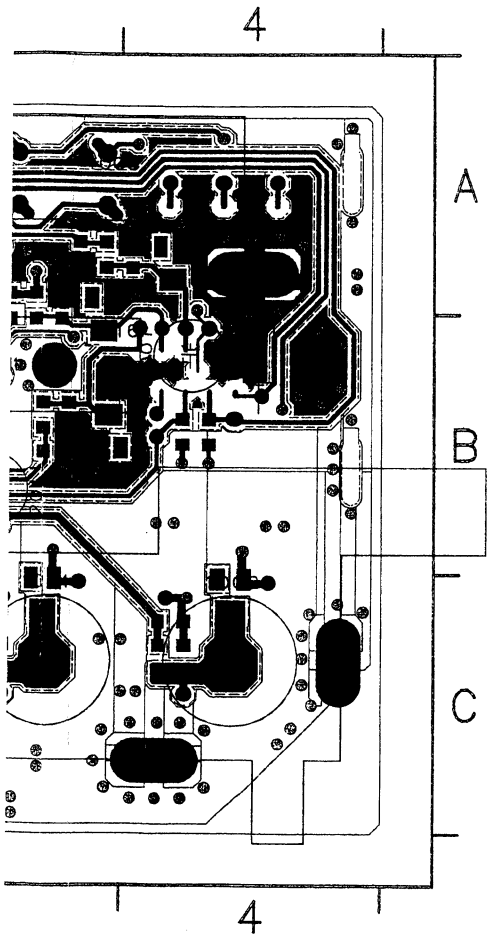


## Block Diagram

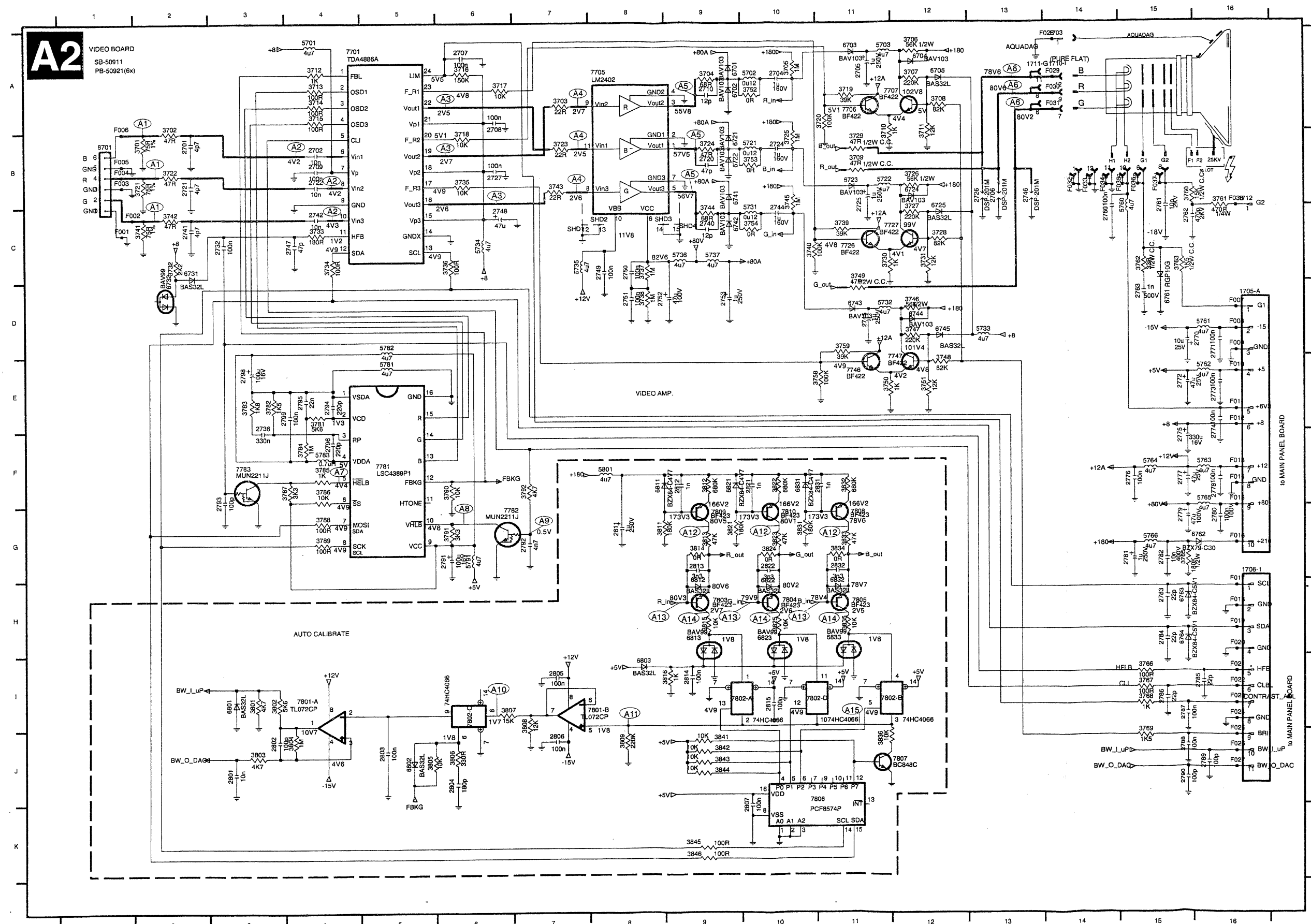


## Terminal Schematic Diagram



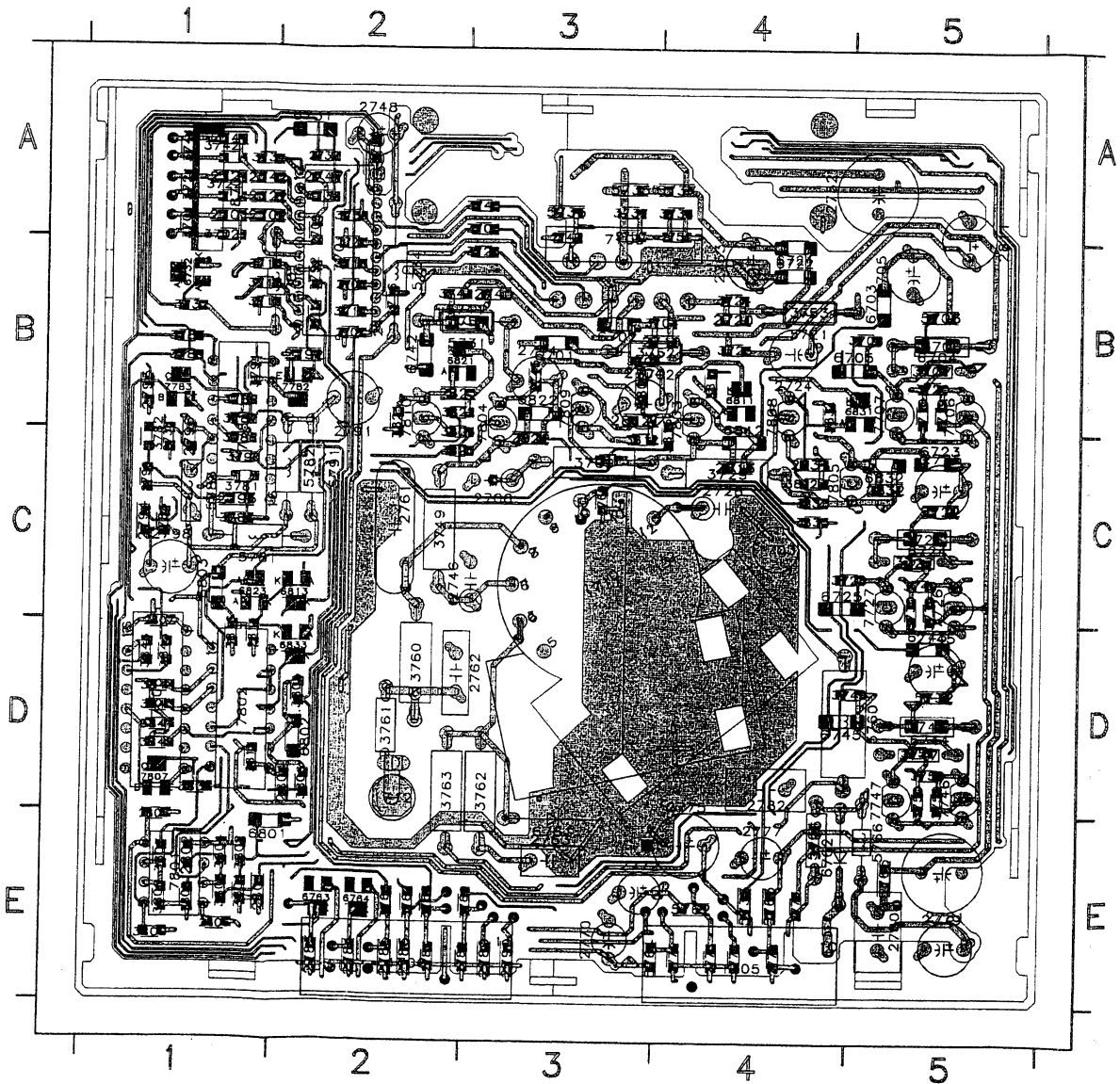


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PCB (A2)

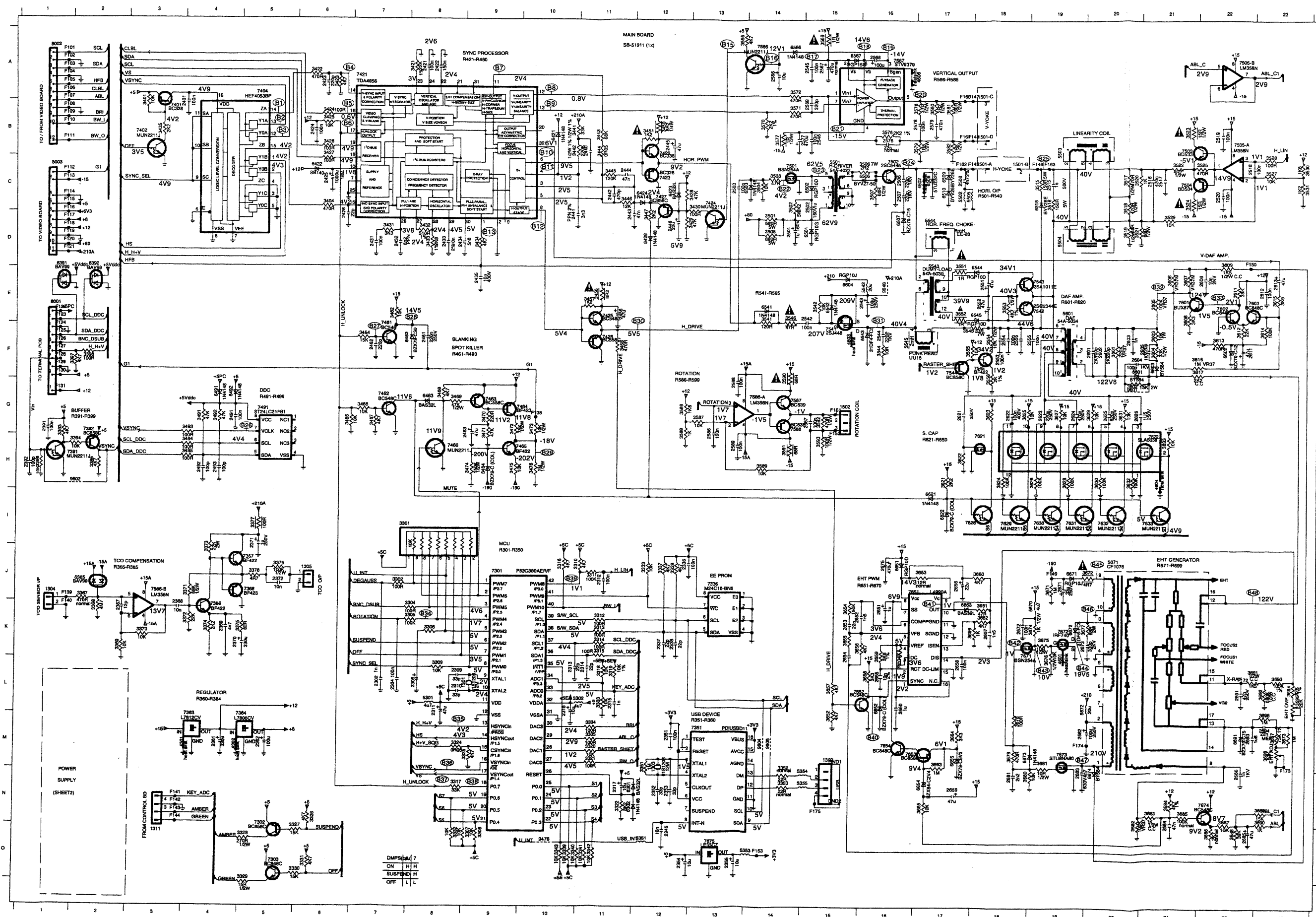
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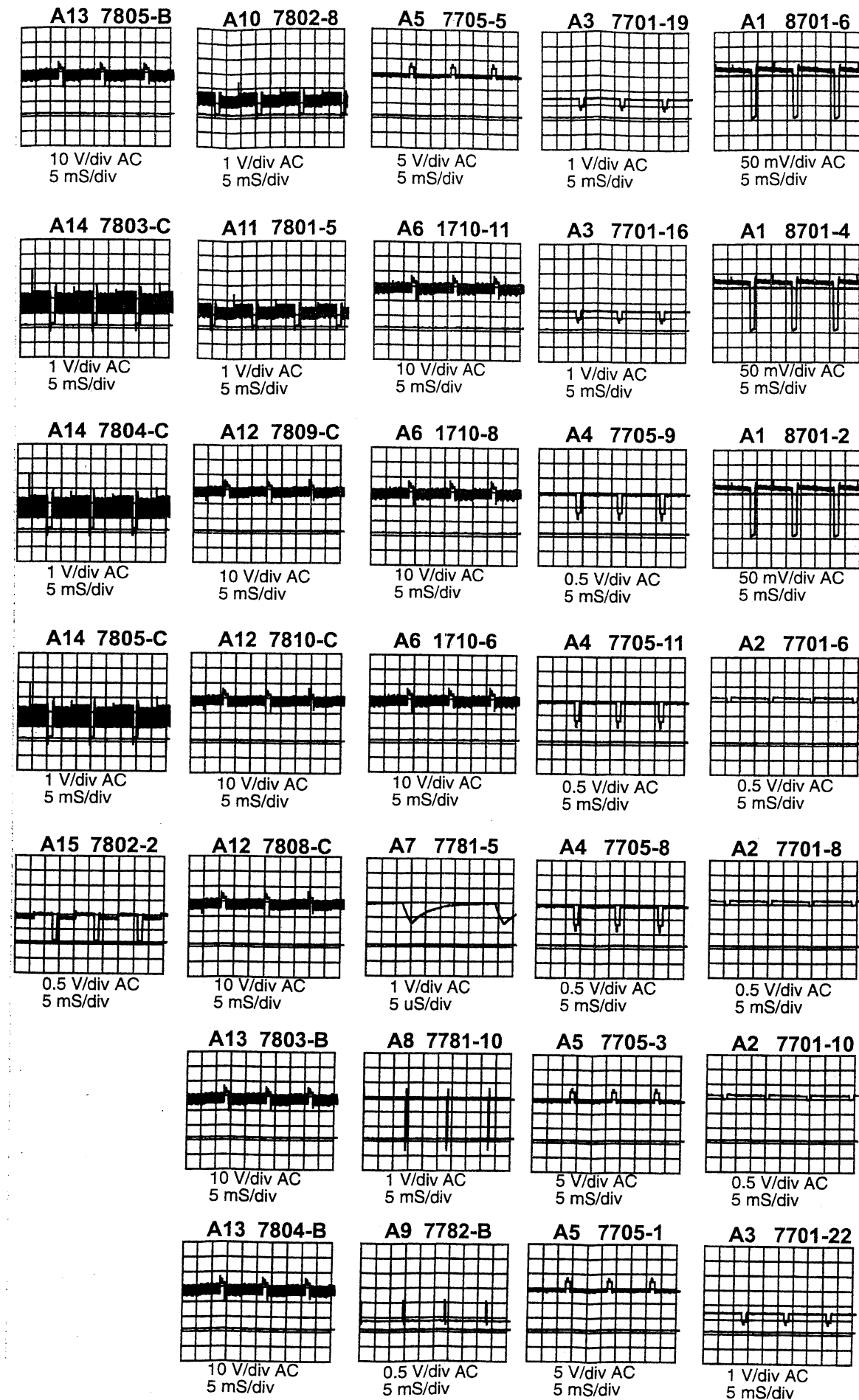


## Deflection Schematic Diagram

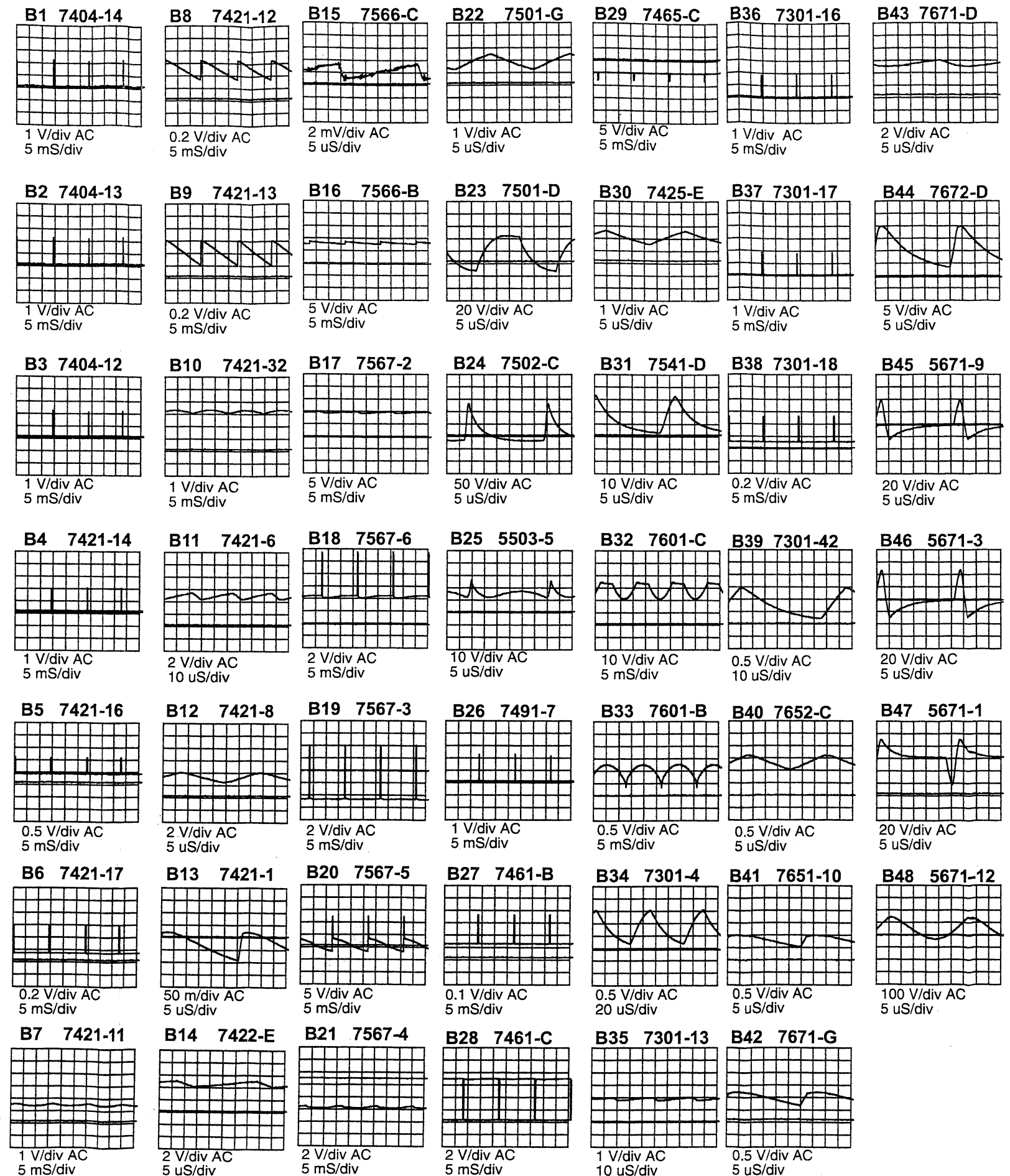


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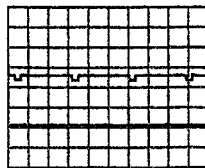
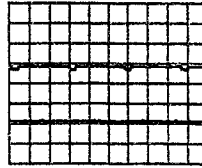
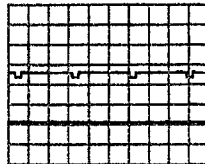
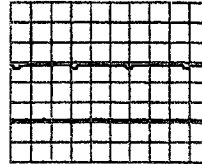
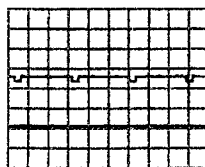
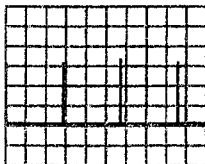
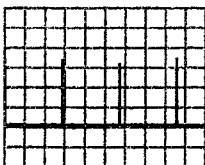
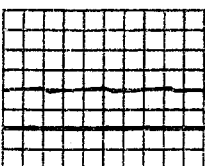
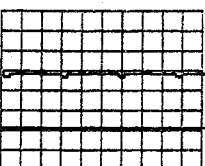
## Waveform (A)



## Waveform (B)

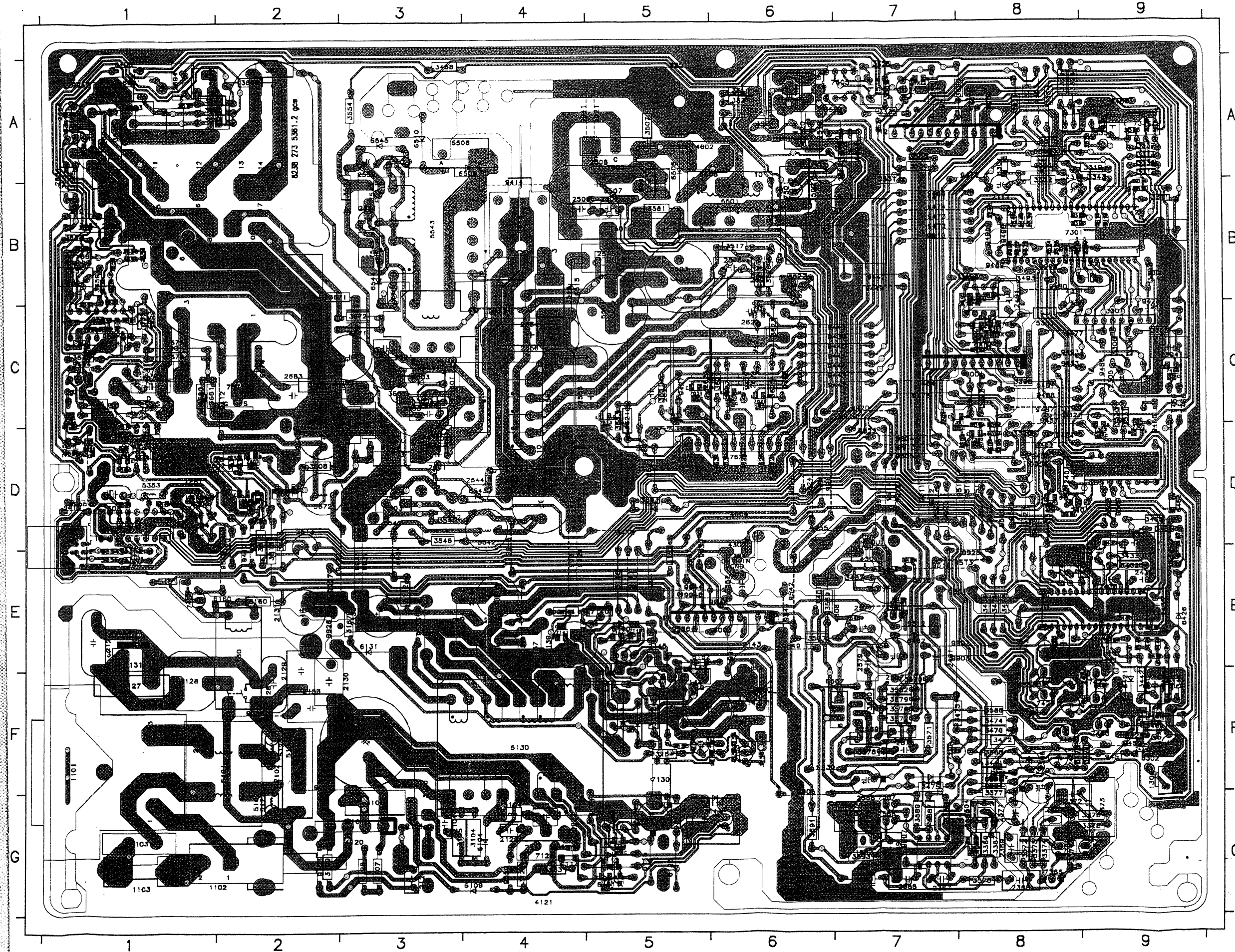




**A16 7001-3**0.5 V/div AC  
5 mS/div**A20 7001-27**1 V/div AC  
5 mS/div**A16 7001-7**0.5 V/div AC  
5 mS/div**A20 7001-29**1 V/div AC  
5 mS/div**A16 7001-11**0.5V/div AC  
5 mS/div**A17 7001-16**0.5 V/div AC  
5 mS/div**A18 7001-18**0.5V/div AC  
5 mS/div**A19 7001-19**1V/div AC  
10  $\mu$ S/div**A20 7001-23**1V/div AC  
5 mS/div

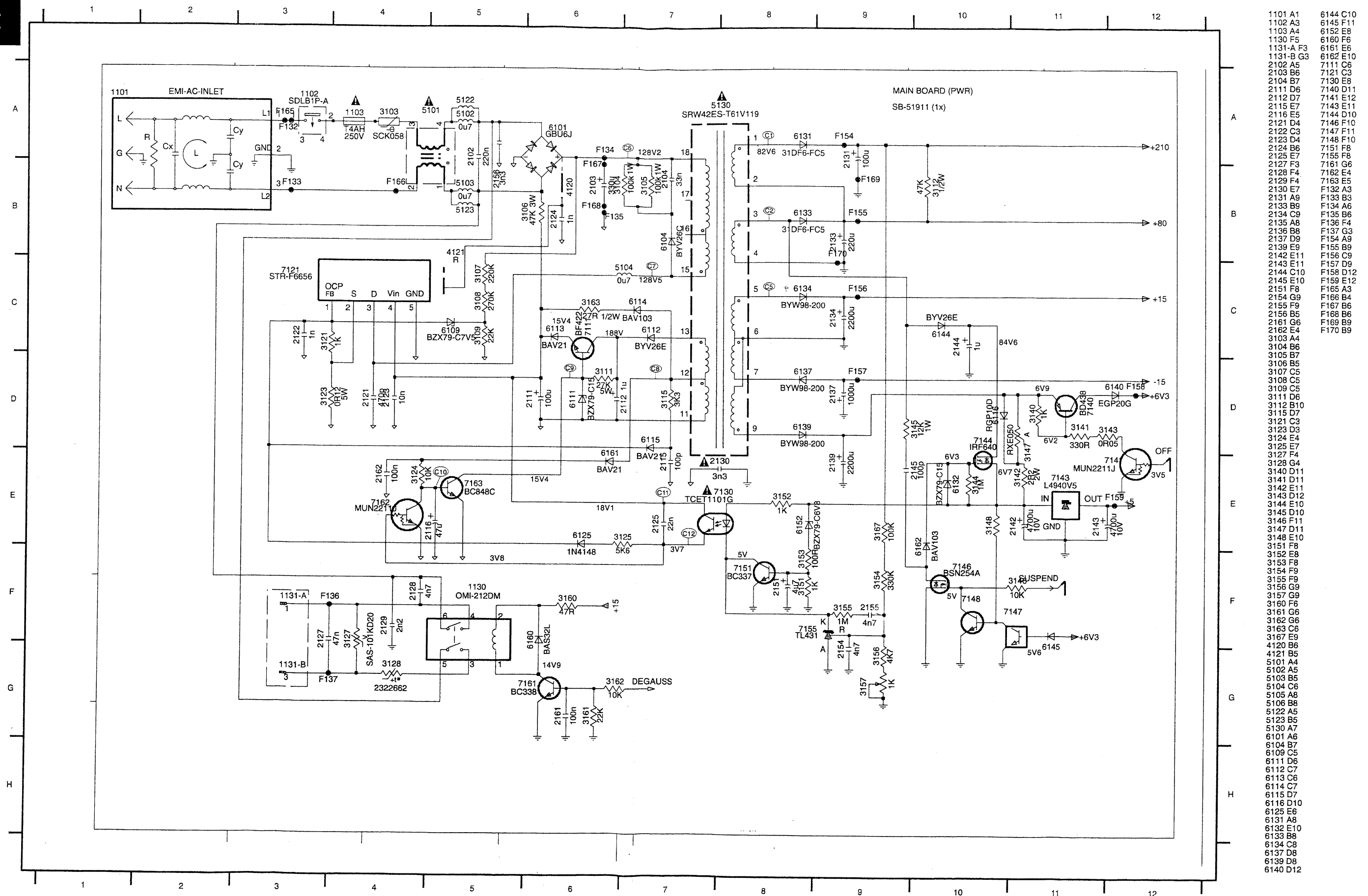


# PCB (B, C)



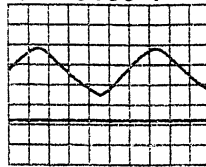
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## Power Supply Schematic Diagram



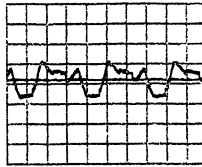
## Waveform (C)

**C1 5130-1**



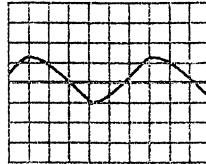
10 V/div AC  
2  $\mu$ S/div

**C8 5130-12**



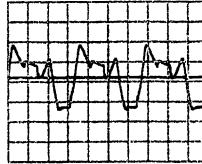
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5 mS/div

**C2 5130-3**



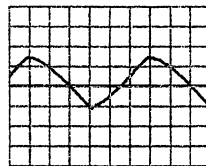
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2  $\mu$ S/div

**C9 7111-B**



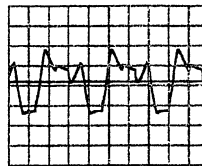
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5 mS/div

**C3 5130-5**



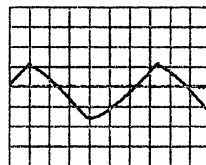
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2  $\mu$ S/div

**C10 7163-B**



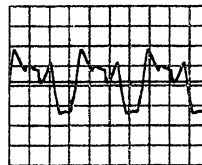
5 V/div AC  
5 mS/div

**C4 5130-5**



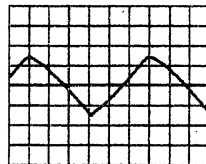
0.5 V/div AC  
2  $\mu$ S/div

**C11 7130-4**



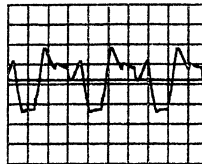
5 V/div AC  
5 mS/div

**C5 5130-9**



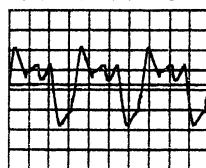
0.2 V/div AC  
2  $\mu$ S/div

**C12 7130-3**



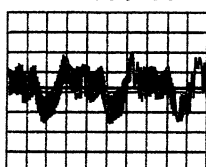
5 V/div AC  
5 mS/div

**C6 5130-18**



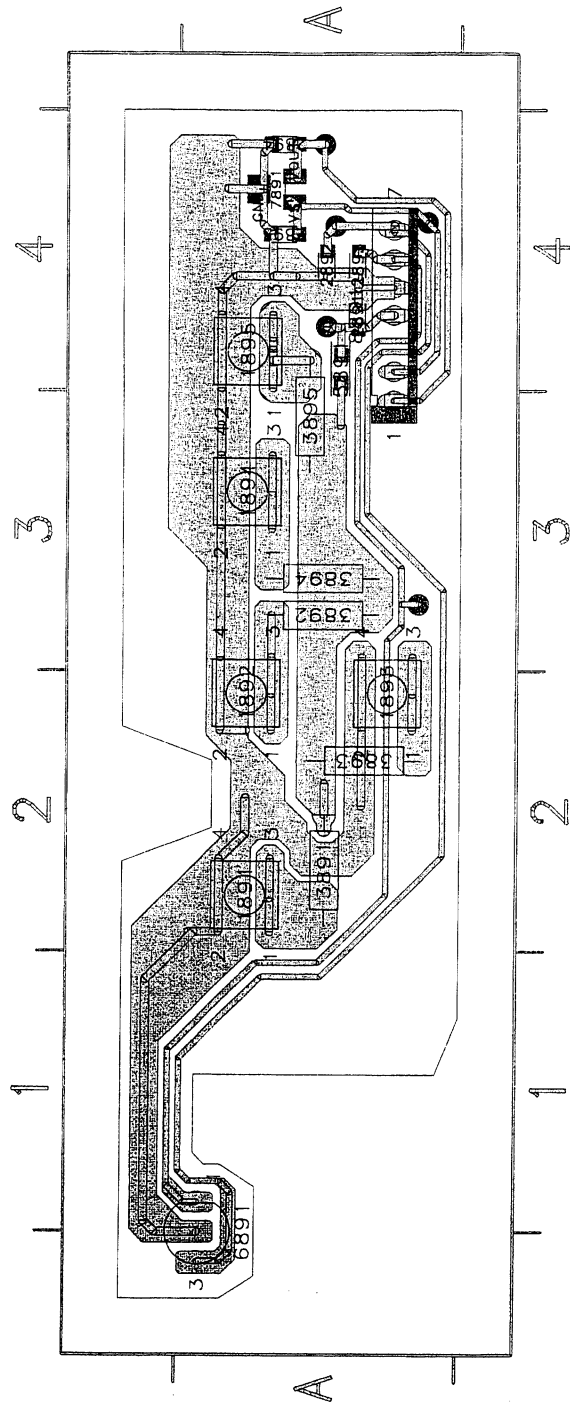
5 V/div AC  
5 mS/div

**C7 5130-18**



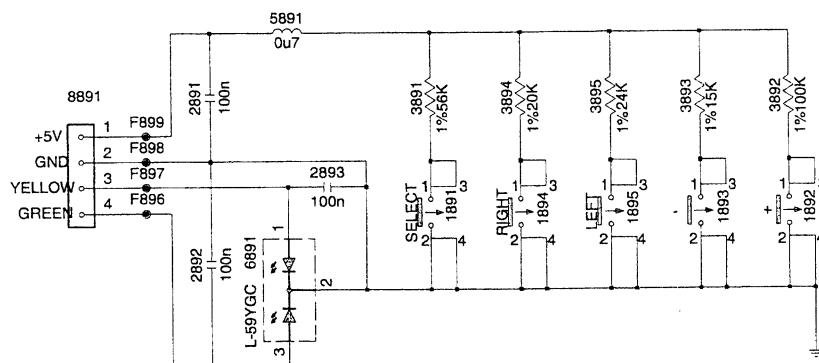
10 V/div AC  
5 mS/div

1891 A2 1893 A2 1895 A4 3892 A3 3894 A3 6891 A1  
 1892 A2 1894 A3 3891 A2 3893 A2 3895 A3 6891 A4



2891 A4 2892 A4 2893 A4 2894 A4 2895 A4 5891 A4 7891 A4

CONTROL BOARD  
SB-52291  
PB-52301 (12x)





## 0. Warning

All ICs and many other semi-conductors are susceptible to electrostatic discharges (ESD). Careless handling during repair can reduce life drastically. When repairing, make sure that you are connected with the same potential as the mass of the unit via a wrist wrap with resistance. Keep components and tools also at the same potential !

## 1. Servicing of SMDs (Surface Mounted Devices)

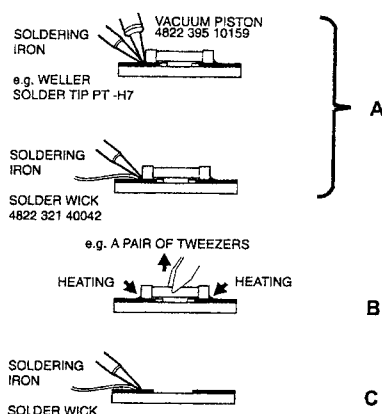
### 1.1 General cautions on handling and storage

- Oxidation on the terminals of SMDs results in poor soldering. Do not handle SMDs with bare hands.
- Avoid using storage places that are sensitive to oxidation such as places with sulphur or chlorine gas, direct sunlight, high temperatures or a high degree of humidity. The capacitance or resistance value of the SMDs may be affected by this.
- Rough handling of circuit boards containing SMDs may cause damage to the components as well as the circuit boards. Circuit boards containing SMDs should never be bent or flexed. Different circuit board materials expand and contract at different rates when heated or cooled and the components and/or solder connections may be damaged due to the stress. Never rub or scrape chip components as this may cause the value of the component to change. Similarly, do not slide the circuit board across any surface.

### 1.2 Removal of SMDs

- Heat the solder (for 2-3 seconds) at each terminal of the chip. By means of litz wire and a slight horizontal force, small components can be removed with the soldering iron. They can also be removed with a solder sucker (see Fig. 1A)

Fig. 1 DISMOUNTING



- While holding the SMD with a pair of tweezers, take it off gently using the soldering iron's heat applied to each terminal (see Fig. 1 B).
- Remove the excess solder on the solder lands by means of litz wire or a solder sucker (see Fig. 1C).

### 1.3 Caution on removal

- When handling the soldering iron, use suitable pressure and be careful.
- When removing the chip, do not use undue force with the pair of tweezers.
- The soldering iron to be used (approx. 30 W) should preferably be equipped with a thermal control (soldering temperature: 225 to 250 °C).
- The chip, once removed, must never be reused.

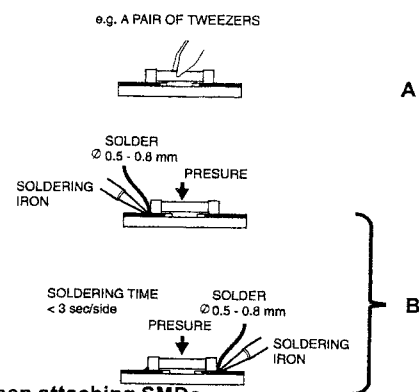
### 1.4 Attachment of SMDs

- Locate the SMD on the solder lands by means of tweezers and

solder the component on one side. Ensure that the component is positioned correctly on the solder lands (see Fig. 2A).

- Next complete the soldering of the terminals of the component (see Fig. 2B).

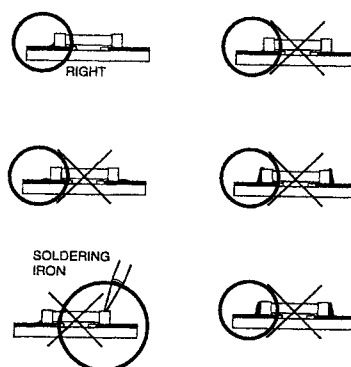
Fig. 2 MOUNTING



## 2. Caution when attaching SMDs

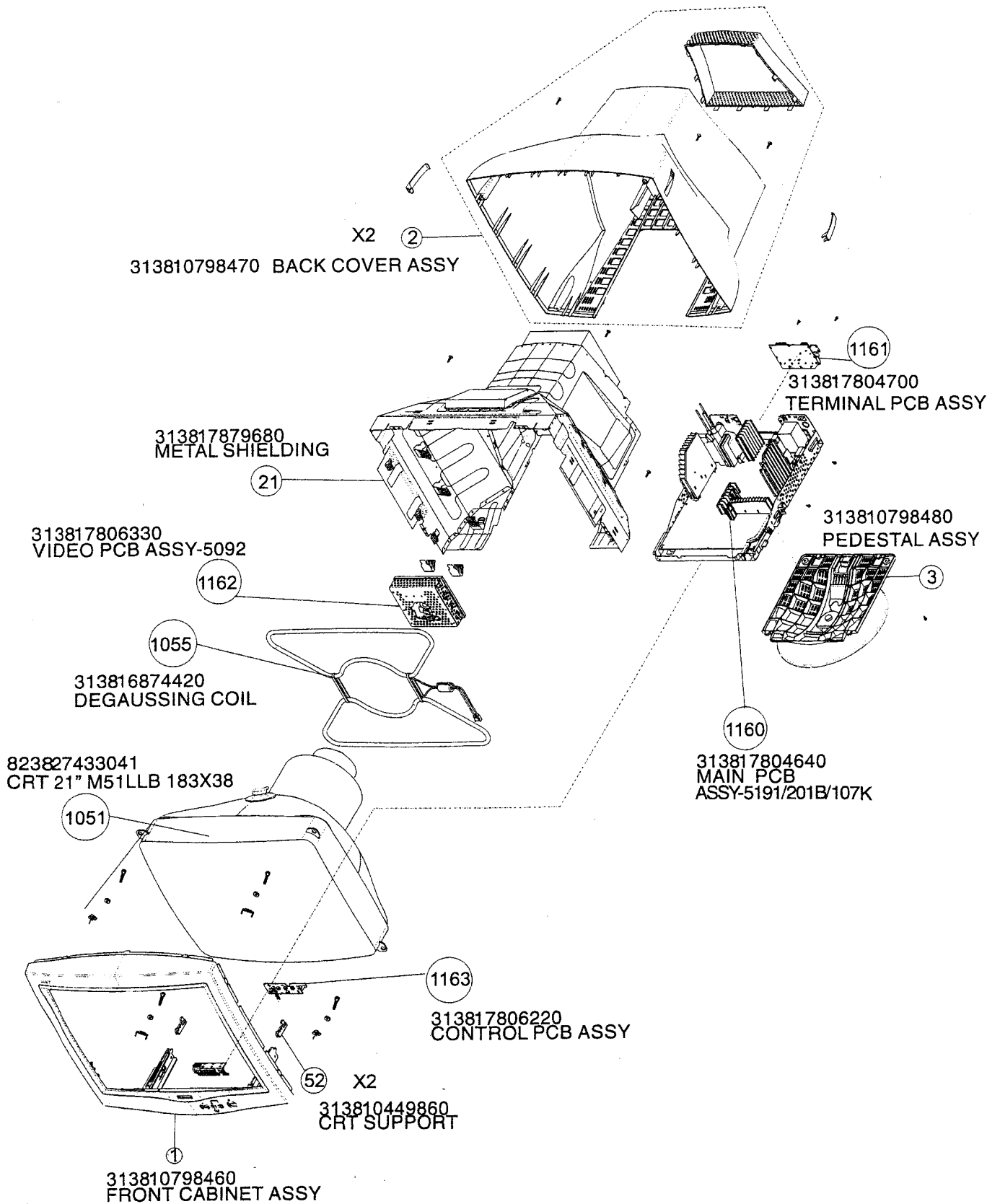
- When soldering the SMD terminals, do not touch them directly with the soldering iron. The soldering should be done as quickly as possible, care must be taken to avoid damage to the terminals of the SMDs themselves.
- Keep the SMD's body in contact with the printed board when soldering.
- The soldering iron to be used (approx. 30 W) should preferably be equipped with a thermal control (soldering temperature: 225 to 250 °C).
- Soldering should not be done outside the solder land.
- Soldering flux (of rosin) may be used, but should not be acidic.
- After soldering, let the SMD cool down gradually at room temperature.
- The quantity of solder must be proportional to the size of the solder land. If the quantity is too great, the SMD might crack or the solder lands might be torn loose from the printed board (see Fig. 3).

Fig. 3 Examples





## Exploded View



# Belinea 108025

## Spare Parts List

partnumber	Location No.	DESCRIPTION	SPEC.
3138 127 50280	0110	FRONT PANEL, PLASTIC	FRONT CABINET ASSY
3138 127 50290	0250	REAR COVER	BACK COVER ASSY
3138 127 50270	0310	PEDESTAL, PLASTIC	PEDESTAL ASSY
3138 107 98050	0390	CONTROL PANEL	OSD CONTROL ASSY
3138 104 48340	0550	KNOB, PLASTIC	ROTARY KNOB
3138 104 54300	0570	COVER, PLASTIC	SCREW COVER-R
3138 104 54290	0590	COVER, PLASTIC	SCREW COVER-L
3138 104 52050	0630	CUSHION, RUBBER	SPONGE
4822 701 20292	0870	SCREW, STEEL	
3138 105 40040	0990	DOC DIRECTIONS FOR USE	D.F.U.
3138 106 58560	1130	BOX, PAPERBOARD	CARTON
3138 106 58090	1150	CUSHION, STYROFOAM	CUSHION - TOP
3138 106 58100	1170	CUSHION, STYROFOAM	CUSHION - BOTTOM
3138 106 55670	1190	BAG, PLASTIC	P.E. BAG
3138 106 58560	1290	BOX, PAPERBOARD	CARTON
3138 106 58090	1310	CUSHION, STYROFOAM	CUSHION - TOP
3138 106 58100	1330	CUSHION, STYROFOAM	CUSHION - BOTTOM
3138 178 78740	4370	CORD, MAINS	MAIN CORD ASSY
3138 168 77520	4390	CABLE, CONNECTING	I/F CABLE
3138 168 74420	4410	COIL, DEGAUSSING	DEGAUSSING COIL
4822 526 20183	4430	STRIP, PLASTIC	SPOILER
3138 127 50280	FRONT PANEL, PLASTIC	FRONT CABINET ASSY	
3138 104 53620	0170	PUSH BUTTON, PLASTIC	POWER KNOB
3138 104 53770	0190	LENS, PLASTIC	LENS-LED
3138 127 50290	REAR COVER	BACK COVER ASSY	
3138 104 54680	0290	REAR COVER	REAR-COVER-LONG
3138 127 50270	PEDESTAL, PLASTIC	PEDESTAL ASSY	
3138 104 54240	0310	BASE, PLASTIC	BASE
3138 104 54250	0330	SWIVEL, PLASTIC	SWIVEL
3138 107 98050	CONTROL PANEL	OSD CONTROL ASSY	
3138 104 48300	0390	KNOB, PLASTIC	KNOB-FUNCTION-L
3138 104 48310	0410	KNOB, PLASTIC	KNOB-FUNCTION-R
3138 104 48320	0430	KNOB, PLASTIC	KNOB-FUNCTION-C
3138 178 51040	201BMAX-H SEMIFINISHED SET		
9322 150 36682	1370	PICTURE TUBE, MONITOR MONOCHR. M51LLB183X38(BH)	
3138 188 05200	201BMAX-107K ALL CHASSIS KIT		
3138 178 51050	1410	PR.CIRCUIT, MONITOR	201BMAX-MAIN PCB ASSY
3138 178 04700	2330	PR.CIRCUIT, MONITOR	TERMINAL PCB ASSY
3138 178 51480	3510	PR.CIRCUIT, MONITOR	201BMAX-ENCORDER PCB ASSY
3138 178 51110	3890	PR.CIRCUIT, MONITOR	109P MAX-LED PCB ASSY
3138 178 50320	4050	PR.CIRCUIT, MONITOR	POWER DOWN PCB ASSY
3138 178 51490	8030	PR.CIRCUIT, MONITOR	201BMAX-VIDEO PCB ASSY
3138 178 51050	PR.CIRCUIT, MONITOR	201BMAX-MAIN PCB ASSY	
3138 178 51160	0000	IC DIG MOS MICROPROCESSOR	OTP CPU ASSY (MAX 19/21/V202)
4822 050 24701	0010	RESISTOR, FIXED, OTHERS <20W	470R00 1% 0,6W
4822 050 24701	0030	RESISTOR, FIXED, OTHERS <20W	470R00 1% 0,6W
4822 050 12202	0050	RESISTOR, FIXED, OTHERS <20W	2K20 1% 0,4W
4822 052 11108	0070	RESISTOR, FIXED, OTHERS <20W	1R00 5% 0,5W

4822 050 24709	0090	RESISTOR, FIXED, OTHERS <20W	47R00	1%	0,6W
4822 050 21808	0110	RESISTOR, FIXED, OTHERS <20W	1R80	1%	0,6W
4822 050 22208	0130	RESISTOR, FIXED, OTHERS <20W	2R20	1%	0,6W
4822 050 21801	0150	RESISTOR, FIXED, OTHERS <20W	180R00	1%	0,6W
4822 050 21808	0170	RESISTOR, FIXED, OTHERS <20W	1R80	1%	0,6W
4822 050 11802	0190	RESISTOR, FIXED, OTHERS <20W	1K80	1%	0,4W
4822 050 21003	0210	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 050 21002	0230	RESISTOR, FIXED, OTHERS <20W	1K00	1%	0,6W
4822 050 21003	0250	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 052 11689	0270	RESISTOR, FIXED, OTHERS <20W	68R00	5%	0,5W
4822 052 11689	0290	RESISTOR, FIXED, OTHERS <20W	68R00	5%	0,5W
4822 050 24701	0310	RESISTOR, FIXED, OTHERS <20W	470R00	1%	0,6W
4822 050 21001	0330	RESISTOR, FIXED, OTHERS <20W	100R00	1%	0,6W
4822 116 10076	0350	RESISTOR, NON-LINEAR	300R		
4822 053 21224	0370	RESISTOR, FIXED, OTHERS <20W	220K00	5%	0,5W
4822 053 21104	0390	RESISTOR, FIXED, OTHERS <20W	100K00	5%	0,5W
4822 117 10118	0410	RESISTOR, FIXED, OTHERS <20W	1M	5%	0,5W
4822 117 10118	0430	RESISTOR, FIXED, OTHERS <20W	1M	5%	0,5W
4822 050 23302	0450	RESISTOR, FIXED, OTHERS <20W	3K30	1%	0,6W
4822 050 21502	0470	RESISTOR, FIXED, OTHERS <20W	1K50	1%	0,6W
4822 050 13903	0490	RESISTOR, FIXED, OTHERS <20W	39K00	1%	0,4W
4822 051 20223	0510	RESISTOR, FIXED, OTHERS <20W	22K00	5%	0,1W
4822 050 24701	0530	RESISTOR, FIXED, OTHERS <20W	470R00	1%	0,6W
4822 117 10837	0550	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 23902	0570	RESISTOR, FIXED, OTHERS <20W	3K90	1%	0,6W
4822 117 10118	0590	RESISTOR, FIXED, OTHERS <20W	1M	5%	0,5W
4822 111 50617	0610	RESISTOR, FIXED, CARBON	2K2	10%	0,5W
4822 117 10837	0630	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 21003	0650	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 117 10837	0670	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 21003	0690	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 117 10837	0710	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 21003	0730	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 117 10837	0750	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 21003	0770	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 117 10837	0790	RESISTOR, FIXED, OTHERS <20W	100K	1%	0,1W
4822 050 21003	0810	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
4822 050 22202	0830	RESISTOR, FIXED, OTHERS <20W	2K20	1%	0,6W
4822 051 20472	0850	RESISTOR, FIXED, OTHERS <20W	4K70	5%	0,1W
4822 116 52179	0870	RESISTOR, FIXED, OTHERS <20W	12E	5%	0,5W
4822 051 20154	0890	RESISTOR, FIXED, OTHERS <20W	150K00	5%	0,1W
4822 051 20472	0910	RESISTOR, FIXED, OTHERS <20W	4K70	5%	0,1W
4822 051 20472	0930	RESISTOR, FIXED, OTHERS <20W	4K70	5%	0,1W
4822 050 13302	0950	RESISTOR, FIXED, OTHERS <20W	3K30	1%	0,4W
4822 050 25602	0970	RESISTOR, FIXED, OTHERS <20W	5K60	1%	0,6W
4822 051 20562	0990	RESISTOR, FIXED, OTHERS <20W	5K6	5%	0,1W 0805
4822 051 20479	1010	RESISTOR, FIXED, OTHERS <20W	47R00	5%	0,1W
4822 051 20472	1030	RESISTOR, FIXED, OTHERS <20W	4K70	5%	0,1W
4822 117 11145	1050	RESISTOR, FIXED, OTHERS <20W	4K70	1%	0,1W
4822 051 20332	1070	RESISTOR, FIXED, OTHERS <20W	3K30	5%	0,1W
4822 117 10833	1090	RESISTOR, FIXED, OTHERS <20W	10K	1%	0,1W
4822 051 20105	1110	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 051 20472	1130	RESISTOR, FIXED, OTHERS <20W	4K70	5%	0,1W
4822 051 20223	1150	RESISTOR, FIXED, OTHERS <20W	22K00	5%	0,1W
4822 050 21005	1170	RESISTOR, FIXED, OTHERS <20W	1M00	1%	0,6W
4822 052 10478	1190	RESISTOR, FIXED, OTHERS <20W	4R70	5%	0,33W
4822 051 20125	1210	RESISTOR, FIXED, OTHERS <20W	1M20	5%	0,1W
4822 050 21002	1230	RESISTOR, FIXED, OTHERS <20W	1K00	1%	0,6W
4822 117 10442	1250	RESISTOR, FIXED, OTHERS <20W	10R	5%	
4822 050 21003	1270	RESISTOR, FIXED, OTHERS <20W	10K00	1%	0,6W
2120 105 92444	1290	RESISTOR, FIXED, OTHERS <20W	RST MOX	2W	RSS S 68R PM5 B
4822 050 21001	1310	RESISTOR, FIXED, OTHERS <20W	100R00	1%	0,6W
4822 050 24701	1330	RESISTOR, FIXED, OTHERS <20W	470R00	1%	0,6W

4822 050 11003	1350	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,4W
4822 117 10442	1370	RESISTOR, FIXED, OTHERS <20W	10R 5%
4822 053 21104	1390	RESISTOR, FIXED, OTHERS <20W	100K00 5% 0,5W
4822 117 11635	1410	RESISTOR, FIXED, OTHERS <20W	1K 10% 0,5W ERC12G AXIAL
4822 050 24702	1430	RESISTOR, FIXED, OTHERS <20W	4K70 1% 0,6W
4822 050 21004	1450	RESISTOR, FIXED, OTHERS <20W	100K00 1% 0,6W
4822 117 12955	1470	RESISTOR, FIXED, OTHERS <20W	2K7 1% 0,1W 0805
4822 117 10833	1490	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 117 10834	1510	RESISTOR, FIXED, OTHERS <20W	47K 1% 0,1W
4822 050 21503	1530	RESISTOR, FIXED, OTHERS <20W	15K00 1% 0,6W
4822 050 21002	1550	RESISTOR, FIXED, OTHERS <20W	1K00 1% 0,6W
4822 050 21502	1570	RESISTOR, FIXED, OTHERS <20W	1K50 1% 0,6W
4822 701 20292	1590	SCREW, STEEL	
4822 053 21684	1590	RESISTOR, FIXED, OTHERS <20W	680K00 5% 0,5W
4822 050 21004	1610	RESISTOR, FIXED, OTHERS <20W	100K00 1% 0,6W
4822 050 27503	1630	RESISTOR, FIXED, OTHERS <20W	75K00 1% 0,6W
2138 365 00102	1650	RESISTOR, VARIAB., OTHERS <20W	RTRM CER LIN 20K H VG067TL1 B
4822 050 21005	1670	RESISTOR, FIXED, OTHERS <20W	1M00 1% 0,6W
4822 050 27503	1690	RESISTOR, FIXED, OTHERS <20W	75K00 1% 0,6W
2138 365 00102	1710	RESISTOR, VARIAB., OTHERS <20W	RTRM CER LIN 20K H VG067TL1 B
4822 051 20102	1730	RESISTOR, FIXED, OTHERS <20W	1K00 5% 0,1W
3138 168 73610	1750	FILTER, MAINS	LINE FILTER (HJC-K8259)
3138 168 74510	1770	BEAD, FERRITE	FERRITE BEAD
3138 168 74510	1790	BEAD, FERRITE	FERRITE BEAD
4822 526 10522	1810	BEAD, FERRITE	
3138 168 74280	1830	TRANSFORMER	POWER TRAN.
4822 152 20596	1850	COIL	
4822 152 20596	1870	COIL	
3138 168 73820	1890	FILTER, L/C	AC INLET ASSY EMI FILTER
4822 142 40349	1890	TRANSFORMER	
4822 276 13476	1910	SWITCH, PUSH BUTTON	
3138 168 74060	1910	BEAD, FERRITE	BEAD BF30UTA-3.5X5X1B
4822 070 34002	1930	FUSE	218004.(4A)
3138 168 73550	1930	COIL	LINEARITY COIL(54A-9050H)
4822 280 70378	1950	RELAY	
3138 168 73540	1950	COIL	LINEARITY COIL(54A-9049H)
4822 265 30891	1970	CONNECTOR, ELECTRICAL OTHERS	2 P.
3138 168 74060	1970	BEAD, FERRITE	BEAD BF30UTA-3.5X5X1B
2422 535 91023	1990	COIL	IND FIX NSL0808 S 22U PM10 A
4822 146 10737	2010	TRANSFORMER	HOR.CENTERING TRANSF.
4822 157 71419	2030	TRANSFORMER	
4822 157 11201	2050	COIL	PUNK HEAD CHOKE
4822 146 10738	2070	TRANSFORMER	DAF TRANSFORMER
4822 152 20596	2090	COIL	
3138 168 76540	2110	TRANSFORMER, LINE OUTPUT	CF1653PH2350
2422 535 91023	2130	COIL	IND FIX NSL0808 S 22U PM10 A
4822 130 60815	2150	DIODE, POWER RECTIFIER	BYV26E
4822 130 30861	2170	DIODE, REFERENCE	BZX79-B7V5
4822 130 34281	2190	DIODE, REFERENCE	BZX79-B15
4822 130 60815	2210	DIODE, POWER RECTIFIER	BYV26E
4822 130 30842	2230	DIODE	BAV21
4822 130 80877	2250	DIODE	BAV103
4822 130 30842	2270	DIODE	BAV21
4822 130 31607	2290	DIODE, POWER RECTIFIER	RGP10D
4822 130 30621	2310	DIODE	1N4148
4822 130 10746	2330	DIODE, POWER RECTIFIER	31DF6
4822 130 34281	2350	DIODE, REFERENCE	BZX79-B15
4822 130 10746	2370	DIODE, POWER RECTIFIER	31DF6
4822 130 83539	2390	DIODE, POWER RECTIFIER	EGP20G
4822 130 60815	2410	DIODE, POWER RECTIFIER	BYV26E
4822 130 30842	2430	DIODE	BAV21
4822 130 34278	2450	DIODE, REFERENCE	BZX79-B6V8
4822 130 80446	2470	DIODE	BAS32L

4822 130 30842	2490	DIODE	BAV21
4822 130 80877	2510	DIODE	BAV103
4822 130 80446	2530	DIODE	BAS32L
4822 130 80446	2550	DIODE	BAS32L
5322 130 34337	2570	DIODE	BAV99
5322 130 34337	2590	DIODE	BAV99
5322 130 34337	2610	DIODE	BAV99
5322 130 34337	2630	DIODE	BAV99
4822 130 30621	2650	DIODE	1N4148
9339 577 60683	2670	DIODE	SB140
4822 130 80446	2690	DIODE	BAS32L
4822 130 30621	2710	DIODE	1N4148
4822 130 30621	2730	DIODE	1N4148
4822 130 34328	2750	DIODE, REFERENCE	BZX79-B30
4822 130 80446	2770	DIODE	BAS32L
4822 130 34233	2790	DIODE, REFERENCE	BZX79-B5V1
4822 130 30621	2810	DIODE	1N4148
4822 130 30621	2830	DIODE	1N4148
4822 130 42489	2850	DIODE, POWER RECTIFIER	BYD33G
4822 130 31607	2870	DIODE, POWER RECTIFIER	RGP10D
4822 130 30621	2890	DIODE	1N4148
5322 130 32184	2910	DIODE, POWER RECTIFIER	BYV27-50
4822 130 34281	2930	DIODE, REFERENCE	BZX79-B15
4822 130 60815	2950	DIODE, POWER RECTIFIER	BYV26E
4822 130 60815	2970	DIODE, POWER RECTIFIER	BYV26E
4822 130 60815	2990	DIODE, POWER RECTIFIER	BYV26E
4822 130 31393	3010	DIODE	BYT52J
4822 130 30621	3030	DIODE	1N4148
4822 130 30621	3050	DIODE	1N4148
4822 130 11113	3070	DIODE, POWER RECTIFIER	31DF4-FC5
4822 130 31607	3090	DIODE, POWER RECTIFIER	RGP10D
4822 130 31607	3110	DIODE, POWER RECTIFIER	RGP10D
4822 130 30621	3130	DIODE	1N4148
5322 130 31969	3150	DIODE, POWER RECTIFIER	RGP15M
4822 130 34197	3170	DIODE, REFERENCE	BZX79-B12
4822 130 30621	3190	DIODE	1N4148
4822 130 34233	3210	DIODE, REFERENCE	BZX79-B5V1
4822 130 31607	3230	DIODE, POWER RECTIFIER	RGP10D
4822 130 34233	3250	DIODE, REFERENCE	BZX79-B5V1
4822 130 80446	3270	DIODE	BAS32L
4822 130 80446	3290	DIODE	BAS32L
4822 130 34233	3310	DIODE, REFERENCE	BZX79-B5V1
4822 130 31393	3330	DIODE	BYT52J
4822 130 30621	3350	DIODE	1N4148
5322 130 32274	3370	DIODE	BY584
4822 130 34685	3390	DIODE, REFERENCE	BZX79-B75
4822 130 41782	3410	TRANSISTOR, <1W	BF422
8238 274 02070	3430	COUPLER, OPTO/PHOTO	TCET1103G
4822 130 40995	3450	TRANSISTOR, >=1W	BD438
4822 130 10829	3470	TRANSISTOR, <1W	MUN2211J
4822 209 13061	3490	IC ANA VOLT./CURR. REGULATOR	L4940V5
9337 739 70687	3510	TRANSISTOR, FET <1W	IRF640
4822 130 63081	3530	TRANSISTOR, FET <1W	BSN254A
4822 130 10829	3550	TRANSISTOR, <1W	MUN2211J
5322 130 42755	3570	TRANSISTOR, <1W	BC847C
4822 130 41344	3590	TRANSISTOR, <1W	BC337-40
4822 209 81397	3610	IC ANA VOLT./CURR. REGULATOR	TL431CLPST
4822 130 40855	3630	TRANSISTOR, <1W	BC337
3138 178 51070	3650	IC DIG MOS EEPROM	EEPROM IC ASSY(7336-M24C16)
4822 130 10829	3650	TRANSISTOR, <1W	MUN2211J
5322 130 42755	3670	TRANSISTOR, <1W	BC847C
4822 130 42513	3690	TRANSISTOR, <1W	BC858C
5322 130 42755	3710	TRANSISTOR, <1W	BC847C

2438 543 00064	3730	CRYSTAL	12MHZ 32P HC49/S B
4822 130 10829	3730	TRANSISTOR, <1W	MUN2211J
4822 265 41422	3750	CONNECTOR, ELECTRICAL OTHERS	6P
4822 130 42513	3750	TRANSISTOR, <1W	BC858C
4822 130 44104	3770	TRANSISTOR, <1W	BC328
4822 265 31231	3790	CONNECTOR, ELECTRICAL OTHERS	3 P MALE
4822 130 10829	3790	TRANSISTOR, <1W	MUN2211J
4822 121 70446	3810	CAPACITOR, FILM	220NF20% 250V
5322 209 10576	3810	IC DIG MOS STANDARD LOGIC	HEF4053BD
4822 124 42168	3830	CAPACITOR, ELECTROLYTIC ALU.	330UF 400V
4822 209 16972	3830	IC ANA OTHERS	TDA4856
8238 274 37250	3850	CAPACITOR, FILM	33NF 400V
4822 130 40855	3850	TRANSISTOR, <1W	BC337
4822 124 12342	3870	CAPACITOR, ELECTROLYTIC ALU.	100UF 35V 20%
4822 130 44104	3870	TRANSISTOR, <1W	BC328
4822 124 12336	3890	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
4822 130 10829	3890	TRANSISTOR, <1W	MUN2211J
2020 558 90542	3910	CAPACITOR, CERAMIC WITH WIRES	CER2 DC B 1KV S 100P PM10 A
4822 130 44503	3910	TRANSISTOR, <1W	BC547C
4822 124 11965	3930	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 25V
4822 130 42231	3930	TRANSISTOR, <1W	BC557C
2020 558 90555	3950	CAPACITOR, FIXED OTHERS	CERAMIC1KV,470PF10%,
4822 130 42513	3950	TRANSISTOR, <1W	BC858C
2252 712 14026	3970	CAPACITOR, CERAMIC SMD	CERHDT 712 2KV S 1N PM10 A
4822 130 44461	3970	TRANSISTOR, <1W	BC546B
5322 122 34098	3990	CAPACITOR, CERAMIC SMD	10NF10%X7R 63V
4822 130 44503	3990	TRANSISTOR, <1W	BC547C
4822 122 33968	4010	CAPACITOR, CERAMIC WITH WIRES	1NF 5% 500V
4822 130 42231	4010	TRANSISTOR, <1W	BC557C
5322 122 32654	4030	CAPACITOR, CERAMIC SMD	CER2 0805 X7R 63V 22N PM10 R
4822 130 41646	4030	TRANSISTOR, <1W	BF423
4822 121 40336	4050	CAPACITOR, FILM	47NF 10% 250V
4822 130 41782	4050	TRANSISTOR, <1W	BF422
4822 126 14084	4070	CAPACITOR, CERAMIC WITH WIRES	4,7NF 20% 250V
4822 130 10829	4070	TRANSISTOR, <1W	MUN2211J
4822 126 14088	4090	CAPACITOR, CERAMIC WITH WIRES	2,2NF 20% 250V
4822 209 15121	4090	IC DIG MOS EEPROM	ST24LC21B1
4822 126 14504	4110	CAPACITOR, CERAMIC WITH WIRES	3,3NF 20% 250V
4822 130 63527	4110	TRANSISTOR, FET >=1W	BSP126
4822 124 11941	4130	CAPACITOR, ELECTROLYTIC ALU.	100UF 20% 250V
5322 130 42631	4130	TRANSISTOR, >=1W	BD243
4822 124 12034	4150	CAPACITOR, ELECTROLYTIC ALU.	220UF 20% 100V
4822 130 63427	4150	TRANSISTOR, >=1W	BD534FI
4822 124 11942	4170	CAPACITOR, ELECTROLYTIC ALU.	2200UF 20% 25V
9333 935 10602	4170	IC ANA OTHERS	LM358N
4822 124 11943	4190	CAPACITOR, ELECTROLYTIC ALU.	1000UF 20% 25V
4822 130 63274	4190	TRANSISTOR, >=1W	2SC2344E
4822 124 11943	4210	CAPACITOR, ELECTROLYTIC ALU.	1000UF 20% 25V
4822 130 63275	4210	TRANSISTOR, >=1W	2SA1011E
4822 124 81285	4230	CAPACITOR, ELECTROLYTIC ALU.	2200UF20% 16V
4822 130 42513	4230	TRANSISTOR, <1W	BC858C
2038 017 00325	4250	CAPACITOR, ELECTROLYTIC ALU.	ELCAP VZ 10V S 4700U PM20 B
4822 130 41782	4250	TRANSISTOR, <1W	BF422
2038 017 00325	4270	CAPACITOR, ELECTROLYTIC ALU.	ELCAP VZ 10V S 4700U PM20 B
4822 130 10829	4270	TRANSISTOR, <1W	MUN2211J
4822 124 42162	4290	CAPACITOR, ELECTROLYTIC ALU.	1UF 160V
9333 935 10602	4290	IC ANA OTHERS	LM358N
2020 558 90542	4310	CAPACITOR, CERAMIC WITH WIRES	CER2 DC B 1KV S 100P PM10 A
4822 130 41053	4310	TRANSISTOR, <1W	BC639
4822 124 40769	4330	CAPACITOR, ELECTROLYTIC ALU.	4,7UF20% 100V
4822 130 41087	4330	TRANSISTOR, <1W	BC638
4822 130 70025	4350	TRANSISTOR, >=1W	BUX87P
5322 122 32268	4370	CAPACITOR, CERAMIC SMD	CER1 0805 NP0 63V 470P PM5

5322 130 42755	4370	TRANSISTOR, <1W	BC847C
4822 126 14504	4390	CAPACITOR, CERAMIC WITH WIRES	3,3NF 20% 250V
5322 130 42755	4390	TRANSISTOR, <1W	BC847C
4822 126 14585	4410	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 130 10829	4410	TRANSISTOR, <1W	MUN2211J
4822 126 14585	4430	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 130 10829	4430	TRANSISTOR, <1W	MUN2211J
5322 122 31647	4450	CAPACITOR, CERAMIC SMD	1NF10%X7R 63V
4822 130 10829	4450	TRANSISTOR, <1W	MUN2211J
4822 121 43696	4470	CAPACITOR, FILM	100NF 100V
4822 130 10829	4470	TRANSISTOR, <1W	MUN2211J
4822 122 33127	4490	CAPACITOR, CERAMIC SMD	2,2NF10%X7R 63V
4822 130 10829	4490	TRANSISTOR, <1W	MUN2211J
5322 122 32659	4510	CAPACITOR, CERAMIC SMD	33PF 5% 50V
4822 209 16244	4510	IC ANA OTHERS	L4990A
5322 122 32659	4530	CAPACITOR, CERAMIC SMD	33PF 5% 50V
4822 130 44503	4530	TRANSISTOR, <1W	BC547C
2038 035 50227	4550	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
4822 130 42513	4550	TRANSISTOR, <1W	BC858C
4822 121 70106	4570	CAPACITOR, FILM	100NF 5% 100V
5322 130 42755	4570	TRANSISTOR, <1W	BC847C
5322 122 32658	4590	CAPACITOR, CERAMIC SMD	22PF 5% 50V
4822 130 63081	4590	TRANSISTOR, FET <1W	BSN254A
5322 122 32658	4610	CAPACITOR, CERAMIC SMD	22PF 5% 50V
4822 130 44503	4610	TRANSISTOR, <1W	BC547C
5322 122 31647	4630	CAPACITOR, CERAMIC SMD	1NF10%X7R 63V
2038 035 50227	4650	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
4822 124 23539	4670	CAPACITOR, ELECTROLYTIC ALU.	10UF20% 50V
4822 122 33127	4690	CAPACITOR, CERAMIC SMD	2,2NF10%X7R 63V
4822 126 14585	4710	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
5322 122 32658	4730	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	4750	CAPACITOR, CERAMIC SMD	22PF 5% 50V
4822 124 81131	4770	CAPACITOR, ELECTROLYTIC ALU.	330UF20% 16V
4822 124 41643	4790	CAPACITOR, ELECTROLYTIC ALU.	100UF 20% 16V DIM:6,3X11MM
4822 126 14585	4810	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
5322 122 32531	4830	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
4822 121 43696	4850	CAPACITOR, FILM	100NF 100V
4822 121 43696	4870	CAPACITOR, FILM	100NF 100V
5322 121 42925	4890	CAPACITOR, FILM	150NF10% 100V
4822 126 14106	4910	CAPACITOR, CERAMIC WITH WIRES	220PF 5% 50V
4822 126 14585	4930	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
2038 034 53102	4950	CAPACITOR, ELECTROLYTIC ALU.	ELCAP VX 16V S 1000U PM20 A
5322 122 32143	4970	CAPACITOR, CERAMIC WITH WIRES	22PF 100V
4822 121 70106	4990	CAPACITOR, FILM	100NF 5% 100V
4822 121 10755	5010	CAPACITOR, FILM	8,2NF 5% 100V
4822 121 70162	5030	CAPACITOR, FILM	10NF5% 400V
4822 051 20008	5030	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP. (0805)
4822 121 10576	5050	CAPACITOR, FILM	5,6NF 2% 100V
4822 121 10695	5070	CAPACITOR, FILM	6.8NF 5% 100V
4822 121 70631	5090	CAPACITOR, FILM	3.3NF 2,5% 100V
5322 122 32268	5110	CAPACITOR, CERAMIC SMD	CER1 0805 NP0 63V 470P PM5
4822 124 22681	5170	CAPACITOR, ELECTROLYTIC ALU.	47UF20% 16V
4822 121 43913	5190	CAPACITOR, FILM	470NF10% 100V
4822 124 22681	5210	CAPACITOR, ELECTROLYTIC ALU.	47UF20% 16V
4822 121 70411	5230	CAPACITOR, FILM	220NF 5% 250V
4822 122 33575	5250	CAPACITOR, CERAMIC SMD	220PF 5% NP0 63V CASE 0805
4822 124 22681	5270	CAPACITOR, ELECTROLYTIC ALU.	47UF20% 16V
4822 121 43696	5290	CAPACITOR, FILM	100NF 100V
5322 122 32531	5310	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
5322 122 32531	5330	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
4822 124 42162	5350	CAPACITOR, ELECTROLYTIC ALU.	1UF 160V
4822 051 20008	5350	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP. (0805)
4822 124 80606	5370	CAPACITOR, ELECTROLYTIC ALU.	1UF20% 160V

4822 121 43696	5390	CAPACITOR, FILM	100NF	100V
2020 558 90561	5410	CAPACITOR, CERAMIC SMD	CERHDT RR	2KV S 220P PM10 A
2020 558 90561	5430	CAPACITOR, CERAMIC SMD	CERHDT RR	2KV S 220P PM10 A
2038 301 00404	5450	CAPACITOR, FILM	CAP PP PPNS	2KV S 4N7 PM5 B
4822 122 33968	5470	CAPACITOR, CERAMIC WITH WIRES	1NF 5%	500V
4822 121 43913	5490	CAPACITOR, FILM	470NF10%	100V
4822 121 43696	5510	CAPACITOR, FILM	100NF	100V
4822 121 43696	5530	CAPACITOR, FILM	100NF	100V
4822 121 43696	5550	CAPACITOR, FILM	100NF	100V
2038 302 00155	5570	CAP MPOL	250V S	100N PM10 B
4822 124 80834	5590	CAPACITOR, ELECTROLYTIC ALU.	100UF20%	250V
2020 558 90561	5610	CAPACITOR, CERAMIC SMD	CERHDT RR	2KV S 220P PM10 A
4822 126 14585	5630	CAPACITOR, CERAMIC SMD	100NF 10%	X7R 0805 50V
4822 126 14585	5650	CAPACITOR, CERAMIC SMD	100NF 10%	X7R 0805 50V
4822 124 40433	5670	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	25V
4822 124 40433	5690	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	25V
4822 121 10783	5710	CAPACITOR, FILM	150NF 5%	250V
4822 121 10783	5730	CAPACITOR, FILM	150NF 5%	250V
4822 124 40248	5750	CAPACITOR, ELECTROLYTIC ALU.	10UF20%	63V
2038 031 42471	5770	ELCAP VT	25V S	470U PM20 B
4822 124 20715	5790	CAPACITOR, ELECTROLYTIC ALU.	100UF 50%	40V
4822 126 14106	5810	CAPACITOR, CERAMIC WITH WIRES	220PF 5%	50V
4822 121 43694	5830	CAPACITOR, FILM	22NF	100V
2038 031 42471	5850	ELCAP VT	25V S	470U PM20 B
4822 121 43696	5870	CAPACITOR, FILM	100NF	100V
4822 121 43913	5890	CAPACITOR, FILM	470NF10%	100V
4822 121 70106	5910	CAPACITOR, FILM	100NF 5%	100V
4822 121 43696	5930	CAPACITOR, FILM	100NF	100V
4822 121 43696	5950	CAPACITOR, FILM	100NF	100V
4822 121 43696	5970	CAPACITOR, FILM	100NF	100V
2252 712 14266	5990	CAPACITOR, CERAMIC WITH WIRES	CERHDT 712	2KV S 270P PM10 A
2020 558 90557	6010	CAPACITOR, CERAMIC WITH WIRES	CERAMIC1KV,	1000PF., 10%,
4822 126 12651	6030	CAPACITOR, CERAMIC WITH WIRES	10NF20%	2K
4822 124 80132	6050	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	25V
4822 126 14585	6070	CAPACITOR, CERAMIC SMD	100NF 10%	X7R 0805 50V
4822 124 41069	6090	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	63V
2038 301 00194	6110	CAP PP PPN	250V S	100N PM5 B
2038 301 00224	6130	CAP MPP MPS	250V S	220N PM5 B
2038 301 00303	6150	CAP MPP MPS	250V S	470N PM5 B
4822 121 10857	6170	CAPACITOR, FILM	820NF 5%	250V
2038 301 00217	6190	CAP MPP MPS	250V S	1U5 PM5 B
4822 124 22669	6210	CAPACITOR, ELECTROLYTIC ALU.	1UF20%	50V
5322 122 31865	6230	CAPACITOR, CERAMIC SMD	CER2 0805 X7R	63V 1N5 PM10 R
5322 122 33446	6250	CAPACITOR, CERAMIC SMD	3,3NF 10%	X7R 50V CASE 120
4822 051 20008	6250	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP.	(0805)
4822 126 13606	6270	CAPACITOR, FILM	10N 2%	100V
4822 124 80144	6290	CAPACITOR, ELECTROLYTIC ALU.	220UF20%	25V
2238 580 16615	6310	CER2 0805 X7R	50V 1N2	PM10 R
2222 780 19867	6330	CAPACITOR, CERAMIC SMD	CER2 0805 Y5V	16V 2U2 P802 R
4822 124 80132	6350	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	25V
4822 126 14325	6370	CAPACITOR, CERAMIC SMD	1UF 80/20%	16V 0805
2222 780 19867	6390	CAPACITOR, CERAMIC SMD	CER2 0805 Y5V	16V 2U2 P802 R
4822 051 20008	6390	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP.	(0805)
4822 124 42161	6410	CAPACITOR, ELECTROLYTIC ALU.	33UF20%	250V
4822 126 14585	6430	CAPACITOR, CERAMIC SMD	100NF 10%	X7R 0805 50V
2020 558 90562	6450	CAPACITOR, CERAMIC SMD	CERHDT RR	2KV S 330P PM10 A
4822 122 33127	6470	CAPACITOR, CERAMIC SMD	2,2NF10%X7R	63V
4822 124 11941	6490	CAPACITOR, ELECTROLYTIC ALU.	100UF 20%	250V
4822 121 10654	6510	CAPACITOR, FILM	4,7NF 5%	630V
4822 121 40336	6530	CAPACITOR, FILM	47NF 10%	250V
4822 124 22681	6550	CAPACITOR, ELECTROLYTIC ALU.	47UF20%	16V
2020 558 90594	6570	CAPACITOR, CERAMIC WITH WIRES	CERHD B RB	1KV S 1N PM10 A
4822 121 40336	6590	CAPACITOR, FILM	47NF 10%	250V



4822 121 70659	6610	CAPACITOR, FILM	1,8UF 5% 100V
4822 121 43694	6630	CAPACITOR, FILM	22NF 100V
4822 116 30469	6650	RESISTOR, FIXED, OTHERS <20W	5R 15%
2138 105 00337	6670	RESISTOR, FIXED, OTHERS <20W	RST MOX 1W RSS A 100K PM5 A
2138 105 00337	6690	RESISTOR, FIXED, OTHERS <20W	RST MOX 1W RSS A 100K PM5 A
2120 105 92436	6710	RESISTOR, FIXED, OTHERS <20W	RST MOX 3W RSS S 47K PM5 B
4822 050 22204	6730	RESISTOR, FIXED, OTHERS <20W	220K00 1% 0,6W
4822 050 22704	6750	RESISTOR, FIXED, OTHERS <20W	270K00 1% 0,6W
4822 116 52257	6770	RESISTOR, FIXED, OTHERS <20W	22K 5% 0,5W
2138 105 00332	6790	RESISTOR, FIXED, OTHERS <20W	RST MOX5W RSM5WS S 22K PM5 B
4822 050 24703	6810	RESISTOR, FIXED, OTHERS <20W	47K00 1% 0,6W
2138 116 13302	6830	RESISTOR, FIXED, OTHERS <20W	RST MFLM MFR-5S A 3K3 PM1 A
4822 050 21002	6850	RESISTOR, FIXED, OTHERS <20W	1K00 1% 0,6W
2138 105 00338	6870	RESISTOR, FIXED, OTHERS <20W	RST MPLT 5W MPR S 0R12 PM10 B
4822 117 10833	6890	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 050 25602	6910	RESISTOR, FIXED, OTHERS <20W	5K60 1% 0,6W
4822 116 40144	6930	RESISTOR, FIXED, OTHERS <20W	12R
4822 116 21237	6950	RESISTOR, NON-LINEAR	1MA/100V
4822 051 20102	6970	RESISTOR, FIXED, OTHERS <20W	1K00 5% 0,1W
4822 050 23301	6990	RESISTOR, FIXED, OTHERS <20W	330R00 1% 0,6W
2120 105 92383	7010	RESISTOR, FIXED, OTHERS <20W	2R2 5% 2W
4822 051 20008	7030	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP. (0805)
4822 051 20105	7050	RESISTOR, FIXED, OTHERS <20W	1M00 5% 0,1W
2120 105 92169	7070	RESISTOR, FIXED, OTHERS <20W	12K 5% 2W
4822 050 21003	7090	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
2122 662 00119	7110	RESISTOR, NON-LINEAR	PTC DC 0A65 60V S 0R31 A
4822 117 11507	7130	RESISTOR, FIXED, OTHERS <20W	6K8 1% 0,1W
4822 051 20102	7150	RESISTOR, FIXED, OTHERS <20W	1K00 5% 0,1W
4822 050 21002	7170	RESISTOR, FIXED, OTHERS <20W	1K00 1% 0,6W
4822 051 20101	7190	RESISTOR, FIXED, OTHERS <20W	100R00 5% 0,1W
4822 050 23304	7210	RESISTOR, FIXED, OTHERS <20W	330K00 1% 0,6W
4822 051 20105	7230	RESISTOR, FIXED, OTHERS <20W	1M00 5% 0,1W
4822 051 20472	7250	RESISTOR, FIXED, OTHERS <20W	4K70 5% 0,1W
4822 101 11825	7270	RESISTOR, VARIAB., OTHERS <20W	1K 20% 300MW
4822 050 24709	7290	RESISTOR, FIXED, OTHERS <20W	47R00 1% 0,6W
4822 050 22203	7310	RESISTOR, FIXED, OTHERS <20W	22K00 1% 0,6W
4822 050 21003	7330	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 050 22709	7350	RESISTOR, FIXED, OTHERS <20W	27R00 1% 0,6W
4822 050 21004	7370	RESISTOR, FIXED, OTHERS <20W	100K00 1% 0,6W
2138 112 03008	7390	RST NETW RNL 8X 10K PM5 B	8X10K 5% 0,8W
4822 051 20101	7410	RESISTOR, FIXED, OTHERS <20W	100R00 5% 0,1W
4822 117 10833	7430	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 050 21001	7450	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 116 52234	7470	RESISTOR, FIXED, OTHERS <20W	100K 5% 0,5W
4822 050 21001	7490	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 117 10833	7510	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 117 10833	7530	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 050 21003	7550	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 051 20472	7570	RESISTOR, FIXED, OTHERS <20W	4K70 5% 0,1W
4822 116 52234	7590	RESISTOR, FIXED, OTHERS <20W	100K 5% 0,5W
4822 050 21001	7610	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 050 21001	7630	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 050 21001	7650	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 050 21001	7670	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 051 20472	7690	RESISTOR, FIXED, OTHERS <20W	4K70 5% 0,1W
4822 050 13303	7710	RESISTOR, FIXED, OTHERS <20W	33K00 1% 0,4W
4822 117 10833	7730	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 050 21003	7750	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 050 21003	7770	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 116 52303	7790	RESISTOR, FIXED, OTHERS <20W	8K2 5% 0,5W
4822 050 21001	7810	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 051 20472	7830	RESISTOR, FIXED, OTHERS <20W	4K70 5% 0,1W
4822 050 24702	7850	RESISTOR, FIXED, OTHERS <20W	4K70 1% 0,6W

4822 050 21503 7870  
 4822 050 22701 7890  
 4822 117 12701 7910  
 4822 050 21503 7930  
 4822 050 24702 7950  
 4822 117 10833 7970  
 4822 117 10833 7990  
 4822 050 21001 8010  
 4822 050 21001 8030  
 4822 051 20008 8050  
 4822 116 52256 8070  
 4822 116 52256 8090  
 4822 117 10833 8110  
 4822 117 10833 8130  
 4822 117 10833 8150  
 4822 117 10833 8170  
 4822 051 20472 8190  
 4822 117 10833 8210  
 4822 051 20472 8230  
 4822 117 10833 8250  
 4822 050 24702 8270  
 4822 050 21001 8290  
 4822 117 10833 8310  
 4822 117 11449 8330  
 4822 051 20008 8350  
 4822 050 24701 8370  
 4822 116 52257 8390  
 4822 050 24701 8410  
 4822 051 20472 8430  
 4822 050 21001 8450  
 4822 117 10833 8470  
 4822 050 21001 8490  
 4822 050 21001 8510  
 4822 050 22205 8530  
 4822 051 20155 8550  
 4822 051 20101 8570  
 4822 051 20332 8590  
 4822 050 25101 8610  
 4822 117 13449 8630  
 4822 051 20472 8650  
 4822 050 23904 8670  
 4822 050 22204 8690  
 4822 050 26803 8710  
 4822 051 20008 8730  
 4822 051 20124 8750  
 4822 117 11383 8770  
 4822 052 10828 8790  
 4822 051 20122 8810  
 4822 052 10828 8830  
 4822 051 20122 8850  
 4822 050 24701 8870  
 4822 050 21003 8890  
 4822 116 83933 8910  
 4822 050 21003 8930  
 4822 050 21003 8950  
 4822 051 20472 8970  
 4822 050 24702 8990  
 4822 050 24703 9010  
 4822 050 22201 9030  
 4822 050 24703 9050  
 4822 050 27503 9070  
 4822 050 21003 9090  
 4822 050 21504 9110

RESISTOR, FIXED, OTHERS <20W 15K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 270R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 15R 1% 0,5W  
 RESISTOR, FIXED, OTHERS <20W 15K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 4K70 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 0R00 JUMP. (0805)  
 RESISTOR, FIXED, OTHERS <20W 2K2 5% 0,5W  
 RESISTOR, FIXED, OTHERS <20W 2K2 5% 0,5W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 4K70 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 4K70 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 4K70 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, CARBON 2K2 5% 0,1W 0805  
 RESISTOR, FIXED, OTHERS <20W 0R00 JUMP. (0805)  
 RESISTOR, FIXED, OTHERS <20W 470R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 22K 5% 0,5W  
 RESISTOR, FIXED, OTHERS <20W 470R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 4K70 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 100R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 2M20 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 1M50 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 100R00 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 3K30 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 510R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 2K8 1% 0,5W  
 RESISTOR, FIXED, OTHERS <20W 4K70 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 390K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 220K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 68K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 0R00 JUMP. (0805)  
 RESISTOR, FIXED, OTHERS <20W 120K00 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 12K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 8R20 5% 0,33W  
 RESISTOR, FIXED, OTHERS <20W 1K20 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 8R20 5% 0,33W  
 RESISTOR, FIXED, OTHERS <20W 1K20 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 470R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 15K 1% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 10K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 4K70 5% 0,1W  
 RESISTOR, FIXED, OTHERS <20W 4K70 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 47K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 220R00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 47K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 75K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 10K00 1% 0,6W  
 RESISTOR, FIXED, OTHERS <20W 150K00 1% 0,6W

4822 050 11003	9130	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,4W
4822 050 21005	9150	RESISTOR, FIXED, OTHERS <20W	1M00 1% 0,6W
4822 117 10834	9170	RESISTOR, FIXED, OTHERS <20W	47K 1% 0,1W
4822 117 10834	9190	RESISTOR, FIXED, OTHERS <20W	47K 1% 0,1W
4822 050 21001	9210	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 051 20101	9230	RESISTOR, FIXED, OTHERS <20W	100R00 5% 0,1W
4822 050 21001	9250	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
2138 105 00335	9270	RESISTOR, FIXED, OTHERS <20W	RST MOX5W RSM5WL S 680R PM5 B
2138 105 00334	9290	RESISTOR, FIXED, OTHERS <20W	RST MOX5W RSM5WS S 2K2 PM5 B
4822 050 24709	9310	RESISTOR, FIXED, OTHERS <20W	47R00 1% 0,6W
4822 050 21003	9330	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
2138 105 00335	9350	RESISTOR, FIXED, OTHERS <20W	RST MOX5W RSM5WL S 680R PM5 B
2138 105 00333	9370	RESISTOR, FIXED, OTHERS <20W	RST MOX 7W RSH S 2R2 PM5 B
4822 117 13081	9390	RESISTOR, FIXED, OTHERS <20W	68R 1% 0,5W
4822 117 12675	9410	RESISTOR, FIXED, OTHERS <20W	150R 5% 5W
4822 117 12675	9430	RESISTOR, FIXED, OTHERS <20W	150R 5% 5W
4822 050 24701	9450	RESISTOR, FIXED, OTHERS <20W	470R00 1% 0,6W
4822 050 24701	9470	RESISTOR, FIXED, OTHERS <20W	470R00 1% 0,6W
4822 117 13081	9490	RESISTOR, FIXED, OTHERS <20W	68R 1% 0,5W
4822 050 21002	9510	RESISTOR, FIXED, OTHERS <20W	1K00 1% 0,6W
4822 117 13081	9530	RESISTOR, FIXED, OTHERS <20W	68R 1% 0,5W
4822 050 24708	9550	RESISTOR, FIXED, OTHERS <20W	4R70 1% 0,6W
4822 052 10159	9570	RESISTOR, FIXED, OTHERS <20W	15R00 5% 0,33W
4822 052 10159	9590	RESISTOR, FIXED, OTHERS <20W	15R00 5% 0,33W
4822 050 24701	9610	RESISTOR, FIXED, OTHERS <20W	470R00 1% 0,6W
4822 117 10833	9630	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 050 21001	9650	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 117 10833	9670	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 051 20182	9690	RESISTOR, FIXED, OTHERS <20W	1K80 5% 0,1W
4822 050 21202	9710	RESISTOR, FIXED, OTHERS <20W	1K20 1% 0,6W
2138 101 13121	9730	RST CRB CFR-12 A 120R PM5 A	RST CRB CFR-12 A 120R PM5 A
4822 050 21003	9750	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 117 10442	9770	RESISTOR, FIXED, OTHERS <20W	10R 5%
4822 117 12941	9790	RESISTOR, FIXED, OTHERS <20W	33R 5% 7W
4822 052 11479	9810	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,5W
4822 052 10108	9830	RESISTOR, FIXED, OTHERS <20W	1R00 5% 0,33W
4822 052 10108	9850	RESISTOR, FIXED, OTHERS <20W	1R00 5% 0,33W
4822 050 24702	9870	RESISTOR, FIXED, OTHERS <20W	4K70 1% 0,6W
4822 050 21003	9890	RESISTOR, FIXED, OTHERS <20W	10K00 1% 0,6W
4822 117 10833	9910	RESISTOR, FIXED, OTHERS <20W	10K 1% 0,1W
4822 051 20202	9930	RESISTOR, FIXED, OTHERS <20W	2K00 5% 0,1W
4822 050 24702	9950	RESISTOR, FIXED, OTHERS <20W	4K70 1% 0,6W
4822 052 11108	9970	RESISTOR, FIXED, OTHERS <20W	1R00 5% 0,5W
4822 050 12202	9990	RESISTOR, FIXED, OTHERS <20W	2K20 1% 0,4W
3138 178 06410	HOR TRANS ASSY(6508/7502)		
4822 466 93161	2070	INSULATOR	
4822 466 92891	2090	INSULATOR	
5322 390 20011	2130	LUBRICANT	PASTE P4 20ML WACKER 060003084
9322 136 02687	2150	DIODE	DIO REC 5TUZ52C (TSOJ) L
9322 144 42671	2170	TRANSISTOR, <1W	TRA POW 2SC5445(AS) (TOSJ) Y
3138 178 06980	VERT IC ASSY(7567-STV9379)		
4822 466 93161	2090	INSULATOR	
4822 492 62076	2110	SPRING	FOR TRANSISTORS
5322 390 20011	2130	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 209 31472	2150	IC ANA OTHERS	STV9379
3138 178 06990	BUCK TRANS. ASSY		
5322 390 20011	2430	LUBRICANT	PASTE P4 20ML WACKER 060003084
9322 118 29687	2450	TRANSISTOR, FET <1W	2SJ448
3138 178 04660	EHT TRANS ASSY(7672/7673)		

4822 701 20292	2450	SCREW, STEEL	
5322 390 20011	2470	LUBRICANT	PASTE P4 20ML WACKER 060003084
9319 001 79687	2490	TRANSISTOR, FET <1W	FET POW IRF740 (SMGK) L
4822 130 11232	2510	TRANSISTOR, FET >=1W	FS7UM16A
3138 178 07020	12V REG ASSY(7363-L7812)		
5322 390 20011	2630	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 209 81726	2650	IC ANA VOLT./CURR. REGULATOR	MC7812CT
3138 178 07030	S-CAP MOSFET ASSY(7622-SLA5058)		
5322 390 20011	2770	LUBRICANT	PASTE P4 20ML WACKER 060003084
9322 145 62667	2790	TRANSISTOR, FET >=1W	FET POW SLA5085 (SAKJ) L
3138 178 07040	POW O/P ASSY(7121-STR F6656)		
4822 492 62076	2910	SPRING	FOR TRANSISTORS
5322 390 20011	2930	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 209 16816	2950	IC ANA OTHERS	STR-F6656(LF1351)
3138 178 07220	DIODE ASSY(6672-31DF6/8E)		
4822 130 10746	3010	DIODE, POWER RECTIFIER	31DF6
3138 178 07050	DIODE ASSY (6135-BYW98-200)		
4822 130 83909	3070	DIODE, POWER RECTIFIER	BYW98-200RL
3138 178 07170	DIODE ASSY(6134-BYW98-200)		
4822 130 83909	3130	DIODE, POWER RECTIFIER	BYW98-200RL
3138 178 07180	DIODE ASSY(6137-BYW98-200)		
4822 130 83909	3190	DIODE, POWER RECTIFIER	BYW98-200RL
3138 178 07190	DIODE ASSY(6139-BYW98-200)		
4822 130 83909	3250	DIODE, POWER RECTIFIER	BYW98-200RL
3138 178 07080	8V REG ASSY(7364-L7808)		
5322 390 20011	3350	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 209 33083	3370	IC ANA VOLT./CURR. REGULATOR	L7808CV
3138 178 07090	DRIDGE ASSY(6101-GBU6J)		
5322 390 20011	3470	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 130 10741	3490	DIODE, BRIDGE	GBU6J
3138 178 51070	IC DIG MOS EEPROM	EEPROM IC ASSY(7336-M24C16)	
5322 255 40958	3690	CONNECTOR, ELECTRICAL OTHERS	8-DIP-S-LC
3138 178 04700	PR.CIRCUIT, MONITOR	TERMINAL PCB ASSY	
4822 265 10782	8670	CONNECTOR, ELECTRICAL OTHERS	887 BM M 6P M2.50 RED B
3138 178 79620	8690	CONNECTOR, ELECTRICAL OTHERS	CON BM H 10P M 2.5 625/626 B
2438 031 00417	8710	CONNECTOR, ELECTRICAL OTHERS	CON BM PAM V 15P F SUB-D B
3138 168 73680	8730	CONNECTOR, COAXIAL	BNC CONNECTOR ASSY
2038 035 50227	8750	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
2038 035 50312	8770	CAPACITOR, ELECTROLYTIC ALU.	220UF 20% 16V
2038 035 00037	8790	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2038 035 00037	8810	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2038 035 00037	8830	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2038 035 00037	8850	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2238 910 16649	8870	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
2238 910 16649	8890	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
2038 035 00037	8910	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2038 035 00037	8930	ELCAP 16V S 47U PM20 A	ELCAP 16V S 47U PM20
2238 910 16649	8950	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
5322 122 32448	8970	CAPACITOR, CERAMIC SMD	10PF 5% NP0 63V CASE 0805
5322 122 32448	8990	CAPACITOR, CERAMIC SMD	10PF 5% NP0 63V CASE 0805
5322 122 32448	9010	CAPACITOR, CERAMIC SMD	10PF 5% NP0 63V CASE 0805

5322 122 32448	9030	CAPACITOR, CERAMIC SMD	10PF 5% NP0 63V CASE 0805
2038 035 50227	9050	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
2038 035 50227	9070	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
2038 035 50227	9090	CAPACITOR, ELECTROLYTIC ALU.	ELCAP SS 10V S 220U PM20 A
5322 122 32658	9110	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9130	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9150	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9170	CAPACITOR, CERAMIC SMD	22PF 5% 50V
2238 910 16649	9190	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
2238 910 16649	9210	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
4822 117 11449	9230	RESISTOR, FIXED, CARBON	2K2 5% 0,1W 0805
4822 117 11449	9250	RESISTOR, FIXED, CARBON	2K2 5% 0,1W 0805
4822 051 20479	9270	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9290	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 051 20479	9310	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9330	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 051 20479	9350	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9370	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 051 20471	9390	RESISTOR, FIXED, OTHERS <20W	470R00 5% 0,1W
4822 051 20471	9410	RESISTOR, FIXED, OTHERS <20W	470R00 5% 0,1W
4822 051 20471	9430	RESISTOR, FIXED, OTHERS <20W	470R00 5% 0,1W
4822 051 20471	9450	RESISTOR, FIXED, OTHERS <20W	470R00 5% 0,1W
4822 051 20479	9470	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9490	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 117 11449	9510	RESISTOR, FIXED, CARBON	2K2 5% 0,1W 0805
4822 051 20479	9530	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9550	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 051 20479	9570	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 117 11927	9590	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 117 11449	9610	RESISTOR, FIXED, CARBON	2K2 5% 0,1W 0805
4822 152 20596	9630	COIL	
4822 152 20596	9650	COIL	
4822 152 20596	9670	COIL	
9322 142 60682	9690	IC ANA OTHERS	IC AN5870 (MATJ) L
3138 178 51480	PR.CIRCUIT, MONITOR	201BMAX-ENCORDER PCB ASSY	
2422 129 16326	3670	SWITCH, ROTARY ENCODER	ROT ENCODER 24P EC12E2420404 B
4822 276 14028	3690	SWITCH UNIT, PUSH-BUTTON	
4822 276 14028	3710	SWITCH UNIT, PUSH-BUTTON	
2238 910 16649	3730	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
2238 910 16649	3750	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
2238 910 16649	3770	CER2 0805 X7R 25V 100N PM10 R	CER2 0805 X7R 25V 100N PM10 R
4822 050 22702	3790	RESISTOR, FIXED, OTHERS <20W	2K70 1% 0,6W
4822 050 25102	3810	RESISTOR, FIXED, OTHERS <20W	5K10 1% 0,6W
2422 549 44197	3830	COIL	IND FXD SM EMI 100MHZ 220R R
3138 178 51110	PR.CIRCUIT, MONITOR	109PMAX-LED PCB ASSY	
9322 146 03682	7170	LED	LED VS L-3WYGW (KIEL) B
3138 178 50320	PR.CIRCUIT, MONITOR	POWER DOWN PCB ASSY	
2438 031 00048	8230	CONNECTOR, PRINTED CIRCUIT	3P. MALE
4822 121 10634	8250	CAPACITOR, FILM	47NF 10% 630V
4822 050 21001	8270	RESISTOR, FIXED, OTHERS <20W	100R00 1% 0,6W
4822 050 24704	8290	RESISTOR, FIXED, OTHERS <20W	470K00 1% 0,6W
4822 053 21225	8310	RESISTOR, FIXED, OTHERS <20W	2M20 5% 0,5W
4822 130 31393	8330	DIODE	BYT52J
4822 130 30842	8350	DIODE	BAV21
4822 130 42231	8370	TRANSISTOR, <1W	BC557C
3138 178 51490	PR.CIRCUIT, MONITOR	201BMAX-VIDEO PCB ASSY	
4822 051 20102	0010	RESISTOR, FIXED, OTHERS <20W	1K00 5% 0,1W
4822 117 11383	0030	RESISTOR, FIXED, OTHERS <20W	12K 1% 0,1W
4822 051 20102	0050	RESISTOR, FIXED, OTHERS <20W	1K00 5% 0,1W

4822 051 20101	0070	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20101	0090	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20101	0110	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20471	0130	RESISTOR, FIXED, OTHERS <20W	470R00	5%	0,1W
4822 051 20471	0150	RESISTOR, FIXED, OTHERS <20W	470R00	5%	0,1W
4822 117 11927	0170	RESISTOR, FIXED, OTHERS <20W	75R	1%	0,1W
4822 051 20479	0190	RESISTOR, FIXED, OTHERS <20W	47R00	5%	0,1W
4822 051 20229	0210	RESISTOR, FIXED, OTHERS <20W	22R00	5%	0,1W
4822 051 20479	0230	RESISTOR, FIXED, OTHERS <20W	47R00	5%	0,1W
4822 051 20105	0250	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 050 25603	0270	RESISTOR, FIXED, OTHERS <20W	56K00	1%	0,6W
4822 050 12204	0290	RESISTOR, FIXED, OTHERS <20W	220K00	1%	0,4W
4822 117 11149	0310	RESISTOR, FIXED, OTHERS <20W	82K	1%	0,1W
4822 116 52195	0330	RESISTOR, FIXED, OTHERS <20W	47E	5%	0,5W
4822 051 20102	0350	RESISTOR, FIXED, OTHERS <20W	1K00	5%	0,1W
4822 117 11383	0370	RESISTOR, FIXED, OTHERS <20W	12K	1%	0,1W
4822 117 11449	0390	RESISTOR, FIXED, CARBON	2K2	5%	0,1W 0805
4822 117 11448	0410	RESISTOR, FIXED, CARBON	180R	1%	0,1W
4822 051 20101	0430	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20471	0450	RESISTOR, FIXED, OTHERS <20W	470R00	5%	0,1W
4822 051 20101	0470	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20105	0490	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 051 20105	0510	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 117 11927	0530	RESISTOR, FIXED, OTHERS <20W	75R	1%	0,1W
4822 051 20479	0550	RESISTOR, FIXED, OTHERS <20W	47R00	5%	0,1W
4822 051 20229	0570	RESISTOR, FIXED, OTHERS <20W	22R00	5%	0,1W
4822 051 20569	0590	RESISTOR, FIXED, OTHERS <20W	56R00	5%	0,1W
4822 051 20105	0610	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 050 25603	0630	RESISTOR, FIXED, OTHERS <20W	56K00	1%	0,6W
4822 050 12204	0650	RESISTOR, FIXED, OTHERS <20W	220K00	1%	0,4W
4822 117 11149	0670	RESISTOR, FIXED, OTHERS <20W	82K	1%	0,1W
4822 116 52195	0690	RESISTOR, FIXED, OTHERS <20W	47E	5%	0,5W
4822 051 20102	0710	RESISTOR, FIXED, OTHERS <20W	1K00	5%	0,1W
4822 117 11383	0730	RESISTOR, FIXED, OTHERS <20W	12K	1%	0,1W
4822 116 80548	0750	RESISTOR, FIXED, OTHERS <20W	15K	5%	0,5W
4822 050 24701	0770	RESISTOR, FIXED, OTHERS <20W	470R00	1%	0,6W
4822 050 21502	0790	RESISTOR, FIXED, OTHERS <20W	1K50	1%	0,6W
4822 050 21804	0810	RESISTOR, FIXED, OTHERS <20W	180K00	1%	0,6W
4822 051 20101	0830	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20101	0850	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20102	0870	RESISTOR, FIXED, OTHERS <20W	1K00	5%	0,1W
4822 117 11139	0890	RESISTOR, FIXED, OTHERS <20W	1K5	1%	0,1W
4822 051 20562	0910	RESISTOR, FIXED, OTHERS <20W	5K6	5%	0,1W 0805
4822 117 11139	0930	RESISTOR, FIXED, OTHERS <20W	1K5	1%	0,1W
4822 051 20182	0950	RESISTOR, FIXED, OTHERS <20W	1K80	5%	0,1W
4822 051 20105	0970	RESISTOR, FIXED, OTHERS <20W	1M00	5%	0,1W
4822 051 20102	0990	RESISTOR, FIXED, OTHERS <20W	1K00	5%	0,1W
4822 117 10833	1010	RESISTOR, FIXED, OTHERS <20W	10K	1%	0,1W
4822 051 20332	1030	RESISTOR, FIXED, OTHERS <20W	3K30	5%	0,1W
4822 051 20101	1050	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 051 20101	1070	RESISTOR, FIXED, OTHERS <20W	100R00	5%	0,1W
4822 117 10833	1090	RESISTOR, FIXED, OTHERS <20W	10K	1%	0,1W
4822 051 20332	1110	RESISTOR, FIXED, OTHERS <20W	3K30	5%	0,1W
4822 117 11145	1130	RESISTOR, FIXED, OTHERS <20W	4K70	1%	0,1W
4822 051 20008	1150	RESISTOR, FIXED, OTHERS <20W	0R00	JUMP.	(0805)
4822 051 20008	1170	RESISTOR, FIXED, OTHERS <20W	0R00	JUMP.	(0805)
4822 051 20008	1190	RESISTOR, FIXED, OTHERS <20W	0R00	JUMP.	(0805)
4822 152 20596	1210	COIL			
3138 178 76910	1230	COIL	0.12UH	10%	
2422 549 44197	1250	COIL	IND FXD SM	EMI 100MHZ 220R R	
3138 178 76910	1270	COIL	0.12UH	10%	
2422 549 44197	1290	COIL	IND FXD SM	EMI 100MHZ 220R R	
3138 178 76910	1310	COIL	0.12UH	10%	

2422 549 44197	1330	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1350	COIL	IND FXD SM EMI 100MHZ 220R R
4822 152 20596	1370	COIL	
2422 549 44197	1390	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1410	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1430	COIL	IND FXD SM EMI 100MHZ 220R R
3138 168 74510	1450	BEAD, FERRITE	FERRITE BEAD
2422 549 44197	1470	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1490	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1510	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1530	COIL	IND FXD SM EMI 100MHZ 220R R
2422 549 44197	1550	COIL	IND FXD SM EMI 100MHZ 220R R
4822 152 20596	1570	COIL	
3138 168 74510	1590	BEAD, FERRITE	FERRITE BEAD
4822 152 20596	1630	COIL	
4822 152 20596	1650	COIL	
3138 178 78600	1670	BEAD, FERRITE	BEAD 07UH VERT.
4822 152 20596	1690	COIL	
2422 549 44197	1710	COIL	IND FXD SM EMI 100MHZ 220R R
4822 130 80877	1730	DIODE	BAV103
4822 130 80877	1750	DIODE	BAV103
4822 130 80877	1770	DIODE	BAV103
4822 130 80877	1790	DIODE	BAV103
4822 130 80446	1810	DIODE	BAS32L
4822 130 80877	1830	DIODE	BAV103
4822 130 80877	1850	DIODE	BAV103
4822 130 80877	1870	DIODE	BAV103
4822 130 80877	1890	DIODE	BAV103
4822 130 80446	1910	DIODE	BAS32L
4822 130 80446	1930	DIODE	BAS32L
5322 130 34337	1950	DIODE	BAV99
4822 130 80877	1970	DIODE	BAV103
4822 130 80877	1990	DIODE	BAV103
4822 130 80877	2010	DIODE	BAV103
4822 130 80877	2030	DIODE	BAV103
4822 130 80446	2050	DIODE	BAS32L
4822 130 42489	2070	DIODE, POWER RECTIFIER	BYD33G
4822 130 34328	2090	DIODE, REFERENCE	BZX79-B30
9352 640 61112	2110	IC ANA OTHERS	
4822 130 41782	2130	TRANSISTOR, <1W	BF422
4822 130 41782	2150	TRANSISTOR, <1W	BF422
4822 130 41782	2170	TRANSISTOR, <1W	BF422
4822 130 41782	2190	TRANSISTOR, <1W	BF422
4822 130 41782	2210	TRANSISTOR, <1W	BF422
4822 130 41782	2230	TRANSISTOR, <1W	BF422
8238 274 35560	2250	IC DIG MOS OTHERS	IC LSC4588P2
4822 130 10829	2270	TRANSISTOR, <1W	MUN2211J
4822 130 10829	2290	TRANSISTOR, <1W	MUN2211J
3138 168 72890	2310	CABLE, CONNECTING	RGB BOARD IN WIRE ASSY
4822 701 20292	8130	SCREW, STEEL	
5322 390 20011	8250	LUBRICANT	PASTE P4 20ML WACKER 060003084
4822 267 10763	8430	CONNECTOR, PRINTED CIRCUIT	10 P. MALE
4822 267 10762	8450	CONNECTOR, PRINTED CIRCUIT	11P. MALE
4822 255 10379	8470	CONNECTOR, PICTURE TUBE	HPS0720-011100
5322 122 32287	8510	CAPACITOR, CERAMIC SMD	4,7PF 5%NP0 50V
5322 122 34098	8530	CAPACITOR, CERAMIC SMD	10NF10%X7R 63V
4822 124 12231	8550	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 160V NK
4822 124 12336	8570	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
2422 549 44346	8590	SPARK GAP	SURGE PROTECT DSP-201M-D04F A
4822 126 14585	8610	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	8630	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	8650	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 13692	8690	CAPACITOR, CERAMIC SMD	47PF 1% NP0 63V

5322 122 32287	8710	CAPACITOR, CERAMIC SMD	4,7PF 5%NP0 50V
5322 122 34098	8730	CAPACITOR, CERAMIC SMD	10NF10%X7R 63V
4822 124 12231	8750	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 160V NK
4822 124 12336	8770	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
2422 549 44346	8790	SPARK GAP	SURGE PROTECT DSP-201M-D04F A
4822 126 14585	8810	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 051 20008	8830	RESISTOR, FIXED, OTHERS <20W	0R00 JUMP. (0805)
4822 126 14107	8850	CAPACITOR, CERAMIC SMD	330NF +-80/20% Y5V 25V
5322 122 32658	8870	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32287	8890	CAPACITOR, CERAMIC SMD	4,7PF 5%NP0 50V
5322 122 34098	8910	CAPACITOR, CERAMIC SMD	10NF10%X7R 63V
4822 124 12231	8930	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 160V NK
4822 124 12336	8950	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
2422 549 44346	8970	SPARK GAP	SURGE PROTECT DSP-201M-D04F A
4822 124 11965	8990	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 25V
4822 126 14585	9010	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	9030	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	9050	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 12331	9070	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 100V
4822 124 12336	9090	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
4822 126 14585	9110	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 12651	9130	CAPACITOR, CERAMIC WITH WIRES	10NF20% 2K
4822 126 14275	9150	CAPACITOR, CERAMIC WITH WIRES	470PF 2KV
4822 122 33968	9170	CAPACITOR, CERAMIC WITH WIRES	1NF 5% 500V
4822 126 14557	9190	CAPACITOR, CERAMIC WITH WIRES	220PF 10% Y5P 1KV
4822 126 14269	9210	CAPACITOR, CERAMIC WITH WIRES	220PF 10% 2KV
4822 124 40248	9230	CAPACITOR, ELECTROLYTIC ALU.	10UF20% 63V
4822 126 14585	9250	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 11965	9270	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 25V
4822 126 14585	9290	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	9310	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 81131	9330	CAPACITOR, ELECTROLYTIC ALU.	330UF20% 16V
4822 126 14585	9350	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 11965	9370	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 25V
4822 126 14585	9390	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 12331	9410	CAPACITOR, ELECTROLYTIC ALU.	47UF 20% 100V
4822 121 43696	9430	CAPACITOR, FILM	100NF 100V
4822 124 12336	9450	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
4822 121 70162	9470	CAPACITOR, FILM	10NF5% 400V
5322 122 32658	9490	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9510	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9530	CAPACITOR, CERAMIC SMD	22PF 5% 50V
5322 122 32658	9550	CAPACITOR, CERAMIC SMD	22PF 5% 50V
4822 126 14585	9570	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 126 14585	9590	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
5322 122 32531	9610	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
5322 122 32531	9630	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
4822 124 41643	9650	CAPACITOR, ELECTROLYTIC ALU.	100UF 20% 16V DIM:6,3X11MM
5322 126 10223	9670	CAPACITOR, CERAMIC SMD	4,7NF10%X7R 63V
5322 122 32531	9690	CAPACITOR, CERAMIC SMD	100PF 5%NP0 50V
4822 122 33575	9710	CAPACITOR, CERAMIC SMD	220PF 5% NP0 63V CASE 0805
5322 122 32654	9730	CAPACITOR, CERAMIC SMD	CER2 0805 X7R 63V 22N PM10 R
4822 122 33575	9750	CAPACITOR, CERAMIC SMD	220PF 5% NP0 63V CASE 0805
4822 124 41643	9770	CAPACITOR, ELECTROLYTIC ALU.	100UF 20% 16V DIM:6,3X11MM
4822 126 14585	9790	CAPACITOR, CERAMIC SMD	100NF 10% X7R 0805 50V
4822 124 12336	9810	CAPACITOR, ELECTROLYTIC ALU.	1UF 20% 250V
4822 117 11927	9830	RESISTOR, FIXED, OTHERS <20W	75R 1% 0,1W
4822 051 20479	9850	RESISTOR, FIXED, OTHERS <20W	47R00 5% 0,1W
4822 051 20229	9870	RESISTOR, FIXED, OTHERS <20W	22R00 5% 0,1W
4822 051 20569	9890	RESISTOR, FIXED, OTHERS <20W	56R00 5% 0,1W
4822 051 20105	9910	RESISTOR, FIXED, OTHERS <20W	1M00 5% 0,1W
4822 050 25603	9930	RESISTOR, FIXED, OTHERS <20W	56K00 1% 0,6W
4822 050 12204	9950	RESISTOR, FIXED, OTHERS <20W	220K00 1% 0,4W



4822 117 11149 9970  
4822 116 52195 9990

RESISTOR, FIXED, OTHERS <20W  
RESISTOR, FIXED, OTHERS <20W

82K 1% 0,1W  
47E 5% 0,5W

3138 178 06390 VIDEO IC ASSY LM2402(7705)  
5322 390 20011 0010  
9322 138 01667 0030  
4822 701 20292 9990

LUBRICANT  
IC ANA OTHERS  
SCREW, STEEL

PASTE P4 20ML WACKER 060003084  
LM2402T

## GENERAL PRODUCT SPECIFICATION

GENERAL PRODUCT  
SPECIFICATION

- . MICRO PROCESSOR - BASED DIGITAL CONTROL WITH 7 FACTORY PRESETS AND 36 USER MODES TO ENSURE PICTURE CONFIGURATIONS ARE ALWAYS MAINTAINED WHEN SWITCH BETWEEN COMMON VIDEO MODES AND USER DEFINED CUSTOM MODES.
- . USER FRIENDLY OSD DISPLAY FOR MODE IDENTIFICATION/ADJUSTMENT
- . DDC1/2B COMMUNICATION CAPABILITY
- . CUSTOMAX (OPTION) FOR MONITOR CONTROL AND ADJUSTMENT
- . MAX. RESOLUTION 1792 X 1344 NON - INTERLACED AT 75 HZ
- . 21" 0.26 MM SHADOW MASK PICTURE TUBE
- . EASY TILT & SWIVEL BASE
- . FULL RANGE POWER SUPPLY 90- 264 VAC
- . CE ENVIRONMENTAL POLICY
- . FLAT SQUARE TUBE TO REDUCE LIGHT REFLECTION
- . POWER MANAGEMENT CAPABILITY
- . PROVIDE USB.HUB & DEVICE FUNCTION ( OPTION )
- . LOW EMISSION TCO 99
- . MOIRE' CANCELLATION
- . AUTO CALIBRATE FUNCTION



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## 1.0 FOREWORD

This specification describes a 21" high resolution digitally controlled autoscanned color monitor with max. resolution up to 1792x1344/75Hz noninterlaced.

## 2.0 PRODUCT PROFILE

This display monitor unit is a complete color display monitor enclosed in a global styling cabinet which has an integrated tilt and swivel base.

### 2.1 CRT

Type NR.	: M51LLB183X61 (BH) (HITACHI)
Dimensions	: 21" shadow mask
Pitch ( mm )	: 0.26
Shadow mask	: Invar mask
Deflection angle	: 90 deg
Light transmission	: 43% (Dark Faceplate Glass)
Surface plate coating	
--Antiglare	: AR-ASC (Anti-Reflection and Anti Static Charge) Coating
Phosphor	: P22
EHT	: 27.0 KV
Useful minimum screen ( mm )	: 406 X 304

### 2.2 Scanning frequencies

Hor. : 30 - 107KHz      Ver. : 50 - 160 Hz



## GENERAL PRODUCT SPECIFICATION



- 2.3 Video dot rate : 261MHz
- 2.4 Power input : 90 - 264 Vac, 47-63 Hz
- 2.5 Power consumption : 115 W typ.
- 2.6 Dimensions : 482(W) x 477(H) x 467(D) mm
- 2.7 Weight : 24 kg

2.8 Functions :

- (1) R/G/B separate analog inputs, H/V composite sync, sync. on green.
- (2) Automatic (Power on) and manual degaussing circuit.

- 2.9 Ambient temperature : 0-35° C

2.10 Regulatory compliance :

- (1) Safety : UL 1950  
: CSA C22.2 NO. 950  
: IEC950/ EN60950
- (2) EMI : FCC PART 15 class B  
: D.O.C. Class B  
: EN55022 Class B  
: CE mark
- (3) X-RAY Radiation requirement / regulation  
: DHHS 21 CFR Subchapter J.
- (4) Low Radiation  
: TCO99
- (5) Environmental Issue  
: Per CE and BU policy
- (6) Ergonomic Requirements  
: ZH 1/618  
: EN 9241-3 / ISO 9241-3 (7/92) / ISO 9241-8

3.0 Electrical characteristics



### 3.1 Interface signals

The input signals can be applied in two different modes :

- 1). Video, Hsync., Vsync.
- 2). Video, CompositeSync

Video : 0.7 Vp-p, input impedance, 75 ohm

Sync. : Separate sync	TTL level, input impedance 2k2 ohm
Hor. sync	Positive/Negative
Ver. sync	Positive/Negative
Composite sync	TTL level, Input impedance 2k2 ohm Positive/Negative

### 3.2 Interface

#### 3.2.1 Cable

The input signals are applied to the display through a detachable shielded cable.

Length : 1.5 m +/- 50 mm (detachable)

Connector type : 15 pin D-Sub male to 15 pin D-Sub male, blue with icon  
IBM PS/2 standard (3 rows)  
with DDC1/ 2B pin assignments





## GENERAL PRODUCT SPECIFICATION

pin assignment :

pin no.	
1	Red video input
2	Green video input / Sync on green
3	Blue video input
4	Optional- connected to pin 10
5	Not connected
6	Red video ground
7	Green video ground
8	Blue video ground
9	+5V
10	Sync ground
11	Optional- connected to pin 10
12	Bi-directional data (SDA)
13	H/H+V sync
14	V sync (VCLK)
15	Data clock (SCL)

3.2.2 Adaptor 15 pin D-standard (2 rows male) to 15 pin D-sub (female)  
for use with Apple Macintosh II . pin assignment :

pin no	15 Pin D-standard
1	RED GND
2	RED VIDEO
3	COMPOSITE SYNC
4	SYNC GND
5	GREEN VIDEO
6	GREEN GND
7	NC
8	NC
9	BLUE VIDEO
10	NC
11	NC
12	NC
13	BLUE GND
14	NC
15	NC



## 3.2.3 Software control functions via OSD/control

- Adjustable functions:

Main Controls
Language
Input
Zoom
Adjust horizontal
Adjust vertical
Adjust shape
Adjust color
Reset to factory settings
Extra Controls
Close Main Controls
Move selection then

### Language

-Language : multi-language( at least 5 language)

### Input

-Input signal selection

### Zoom

- Zoom

### Adjust horizontal

-Adjust position  
-Adjust size

### Adjust vertical

-Adjust position  
-Adjust size

### Adjust shape

-Adjust side curve  
Pincushion  
Balanced  
-Adjust side angles  
Trapezoid  
Parallelogram  
-Rotate image  
Rotate



## GENERAL PRODUCT SPECIFICATION



## Adjust color

- 9300° K for general use
- 6500° K for image management
- 5500° K for photoretouch
- User preset

## Reset to factory settings

- No
- Yes

## Extra Controls

- degauss
- Adjust moire

Horizontal  
Vertical

- Auto calibrate

## 3.3 Timing requirement

## 3.3.1 Mode storing capacity

Total modes available	: 50
(1) Factory preset modes	: 36
(2) User modes	: 14

## 3.3.2 Factory preset timings

The factory settings of size and centering are according to the reference timing charts ( see fig-8, fig-9 )





MODE NO.	1	2	3	4
RESOLUTION	640 x 350	640 x 480	720 x 400	640 x 480
Dot clock(MHz)	25.175	25.175	28.321	31.500
f h	31.469 kHz	31.469 kHz	31.468 kHz	37.500 KHz
A ( us )	31.778	31.778	31.778	26.667
B ( us )	3.813	3.813	3.813	2.032
C ( us )	1.907	1.907	1.907	3.810
D ( us )	25.422	25.422	25.423	20.317
E ( us )	0.636	0.636	0.325	0.508
f v	70.087 Hz	59.941 Hz	70.084 Hz	75.000 Hz
O (ms)	14.268	16.683	14.268	13.333
P (ms)	0.064	0.064	0.064	0.080
Q (ms)	1.907	1.049	1.112	0.427
R (ms)	11.122	15.253	12.711	12.800
S (ms)	1.175	0.317	0.382	0.026
SYNC. H/V POLARITY	+/-	-/-	-/+	-/-
SEP. SYNC	Y	Y	Y	Y

MODE NO.	5	6	7	8
RESOLUTION	640 x 480	640x350	800x600	720x400
Dot clock(MHz)	31.500	31.500	40.000	35.500
f h	37.861 kHz	37.861 kHz	37.879 kHz	37.927 kHz
A ( us )	26.413	26.413	26.400	26.366
B ( us )	1.270	2.032	3.200	2.028
C ( us )	3.810	3.048	2.200	3.042
D ( us )	20.317	20.317	20.000	20.282
E ( us )	1.016	1.016	1.000	1.014
f v	72.810 Hz	85.081 Hz	60.317Hz	85.039 Hz
O (ms)	13.735	11.754	16.579	11.759
P (ms)	0.079	0.079	0.106	0.079
Q (ms)	0.528	1.585	0.607	1.107
R (ms)	12.678	9.245	15.840	10.546
S (ms)	0.45	0.845	0.026	0.027
SYNC. H/V POLARITY	-/-	+/-	+ / +	- / +
SEP. SYNC	Y	Y	Y	Y

# GENERAL PRODUCT SPECIFICATION

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MODE NO.	9	10	11	12
RESOLUTION	640 x 480	800 x 600	800 x 600	1024 x 768
Dot clock(MHz)	36.000	49.500	50.000	65.000
f h	43.269 kHz	46.875 kHz	48.077 kHz	48.363 kHz
A (us)	23.111	21.333	20.800	20.677
B (us)	1.556	1.616	2.400	2.092
C (us)	2.222	3.232	1.280	2.462
D (us)	17.778	16.162	16.000	15.754
E (us)	1.555	0.323	1.12	0.369
f v	85.008 Hz	75.000 Hz	72.188 Hz	60.004 Hz
O (ms)	11.763	13.333	13.853	16.666
P (ms)	0.069	0.064	0.125	0.124
Q (ms)	0.578	0.448	0.478	0.600
R (ms)	11.093	12.800	12.480	15.880
S (ms)	0.023	0.021	0.77	0.062
SYNC. H/V	-/-	+/+	+/+	-/-
POLARITY				
SEP. SYNC	Y	Y	Y	Y

MODE NO.	13	14	15	16
RESOLUTION	832 x 624	640 x 480	800 x 600	1024 x 768
Dot clock(MHz)	57.280	40.500	56.250	75.000
f h	49.722 kHz	50.628 kHz	53.674 kHz	56.476 kHz
A (us)	20.110	19.752	18.631	17.707
B (us)	1.117	1.580	1.138	1.813
C (us)	3.910	1.975	2.702	1.920
D (us)	14.520	15.802	14.222	13.653
E (us)	0.563	0.395	0.569	0.321
f v	74.546 Hz	100.10 Hz	85.061 Hz	70.069 Hz
O (ms)	13.410	9.995	11.756	14.272
P (ms)	0.060	0.059	0.056	0.016
Q (ms)	0.784	0.435	0.503	0.513
R (ms)	12.550	9.481	11.179	13.599
S (ms)	0.016	0.020	0.018	0.054
SYNC. H/V	+/+	-/-	+/+	-/-
POLARITY				
SEP. SYNC	Y	Y	Y	Y

# GENERAL PRODUCT SPECIFICATION

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MODE NO.	17	18	19	20
RESOLUTION	1280 x 960	1024 x 768	800 x 600	1280 x 1024
Dot clock(MHz)	108.000	78.750	67.500	108.000
f <sub>h</sub>	60.000 kHz	60.023 kHz	63.923 kHz	63.981 kHz
A (us)	16.667	16.660	15.644	15.630
B (us)	1.037	1.219	0.948	1.037
C (us)	2.889	2.235	2.370	2.296
D (us)	11.852	13.003	11.852	11.852
E (us)	0.889	0.203	0.474	0.445
f <sub>v</sub>	60.000 Hz	75.029 Hz	100.00 Hz	60.020 Hz
O (ms)	16.667	13.328	9.997	16.661
P (ms)	0.050	0.050	0.047	0.047
Q (ms)	0.600	0.466	0.548	0.594
R (ms)	16.000	12.795	9.387	16.005
S (ms)	0.017	0.017	0.015	0.015
SYNC. H/V	+ / +	+ / +	+ / +	+ / +
POLARITY				
SEP. SYNC	Y	Y	Y	Y

MODE NO.	21	22	23	24
RESOLUTION	1152 x 864	1024 x 768	1152 x 870	1152 x 900
Dot clock(MHz)	108.000	94.500	100.000	108.000
f <sub>h</sub>	67.500 kHz	68.677 kHz	68.681 kHz	71.809 kHz
A (us)	14.815	14.561	14.560	13.926
B (us)	1.185	1.016	1.280	0.593
C (us)	2.370	2.201	1.440	2.519
D (us)	10.667	10.836	11.520	10.667
E (us)	0.593	0.508	0.32	0.147
f <sub>v</sub>	75.000 Hz	84.997 Hz	74.979 Hz	76.150 Hz
O (ms)	13.333	11.765	13.333	13.132
P (ms)	0.044	0.044	0.044	0.111
Q (ms)	0.474	0.524	0.568	0.460
R (ms)	12.800	11.183	12.678	12.533
S (ms)	0.015	0.014	0.043	0.028
SYNC. H/V	+ / +	+ / +	- / -	+ / +
POLARITY				
SEP. SYNC	Y	Y	Y	Y

## GENERAL PRODUCT SPECIFICATION

MODE NO.	25	26	27	28
RESOLUTION	1600 x 1200	1280 x 1024	1600 x 1200	1792 x 1344
Dot clock(MHz)	162.000	135.00	175.500	204.750
f <sub>h</sub>	75.000 kHz	79.976 kHz	81.250 kHz	83.640 kHz
A (us)	13.333	12.504	12.308	11.956
B (us)	1.185	1.067	1.094	0.977
C (us)	1.877	1.837	1.732	1.602
D (us)	9.877	9.481	9.117	8.752
E (us)	0.394	0.119	0.365	0.625
f <sub>v</sub>	60.000 Hz	75.024 Hz	65.000 Hz	59.999 Hz
O (ms)	16.667	13.329	15.385	16.667
P (ms)	0.040	0.038	0.037	0.036
Q (ms)	0.613	0.475	0.566	0.550
R (ms)	16.000	12.804	14.769	16.069
S (ms)	0.014	0.012	0.013	0.012
SYNC. H/V	+ / +	+ / +	+ / +	+ / +
POLARITY				
SEP. SYNC	Y	Y	Y	Y

MODE NO.	29	30	31	32
RESOLUTION	1280 x 960	1856 x 1392	1600 x 1200	1920 x 1440
Dot clock(MHz)	148.500	218.250	189.000	234.000
f <sub>h</sub>	85.938 kHz	86.333 kHz	87.500 kHz	90.000 kHz
A (us)	11.636	11.583	11.429	11.111
B (us)	1.077	1.026	1.016	0.889
C (us)	1.508	1.489	1.608	1.470
D (us)	8.620	8.504	8.466	8.205
E (us)	0.431	0.564	0.339	0.547
f <sub>v</sub>	85.002 Hz	59.995 Hz	70.000 Hz	60.000 Hz
O (ms)	11.764	16.668	14.286	16.667
P (ms)	0.035	0.035	0.034	0.033
Q (ms)	0.547	0.498	0.526	0.622
R (ms)	11.171	16.124	13.715	16.000
S (ms)	0.011	0.011	0.011	0.012
SYNC. H/V	+ / +	+ / +	+ / +	+ / +
POLARITY				
SEP. SYNC	Y	Y	Y	Y

# GENERAL PRODUCT SPECIFICATION

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MODE NO.	33	34	35	36
RESOLUTION	1280 x 1024	1600 x 1200	1600 x 1200	1792 x 1344
Dot clock(MHz)	157.500	202.500	229.500	261.000
f h	91.146 kHz	93.750 kHz	106.250 kHz	106.270 kHz
A ( us )	10.971	10.667	9.412	9.410
B ( us )	1.016	0.948	0.837	0.828
C ( us )	1.422	1.501	1.325	1.349
D ( us )	8.127	7.901	6.972	6.866
E ( us )	0.406	0.317	0.278	0.367
f v	85.024 Hz	75.000 Hz	85.000 Hz	74.997 Hz
O ( ms )	11.761	13.334	11.765	13.334
P ( ms )	0.033	0.032	0.028	0.028
Q ( ms )	0.483	0.491	0.433	0.649
R ( ms )	11.234	12.800	11.294	12.647
S ( ms )	0.011	0.011	0.01	0.01
SYNC. H/V POLARITY	+ / +	+ / +	+ / +	+ / +
SEP. SYNC	Y	Y	Y	Y



## GENERAL PRODUCT SPECIFICATION



## 3.3.3 Horizontal scanning

Sync polarity : Positive or Negative  
 Scanning frequency : 30 - 107 KHz  
 Retrace time : 1.87  $\mu$ sec

## 3.3.4 Vertical scanning

Sync polarity : Positive or Negative  
 Scanning frequency : 50 - 160 Hz

## 3.4 Power input connection

Power cord length : 1.5 M  
 Power cord type : 3 leads detachable power cord with protective earth plug.

## 3.5 Video amplifiers

Rise time/Fall time : 4.0 / 4.5 ns  
 (excluding rise/fall time due to test pattern & test probe)  
 Overshoot/undershoot : Max. 12%  
 Black level shift : Max. 3%  
 Sag : Max. 5%

## 3.6 Degaussing

An automatic degaussing circuit is provided and requires no intervention  
 The degaussing is activated at the time of switch-on and power saving  
 wake up or switch-on again after switched-off for longer than 30 minutes  
 Manual degaussing is provided to eliminate any color impurity.

## 3.7 Requirement for low emission

TCO

- (1) Electrostatic :  $\pm 0.5$  KV  
 potential  
 (2) Alternating Elec. field

ELF 5 - 2 KHz :  $\leq 10.0$  V/M  
 VLF 2 - 400 KHz :  $\leq 1.0$  V/M

## (3) Magnetic field

ELF 5 - 2 KHz :  $\leq 200$  nT  
 VLF 2 - 400 KHz :  $\leq 25$  nT

## 3.8 Power management

The power consumption and the status indication of the set with power management function are as follows,

<u>STATUS</u>	<u>Horizontal</u>	<u>Vertical</u>	<u>Power Spec</u>	<u>LED</u>
On	Pulse	Pulse	as normal on	Green
Stand-by	No Pulse	Pulse	< 8 W	Yellow
Suspend	Pulse	No Pulse	< 8 W	Yellow
Power off	No Pulse	No Pulse	< 3 W	Amber

Entering from ON state to Power saving state must has 5 - 10 second time delay. It must awake from Suspend state to On state within 3 seconds.

According to VESA power saving signalling.  
TCO95 power saving requirement  
EPA energy star requirement

## 3.9 Display identification

In accordance with VESA Display Channel Standard V1.0 and having DDC 1 and DDC 2B capability

## 3.10 Customax (option)

The Customax provides the following control and adjustment capability, detailed please see the document "Software for your monitor".

1. Screen geometry control: H-size, V-size, H-shift, V-shift, Tilt, Parallelogram, Trapezoid, Symmetry, Pincushion, background pattern, etc.
2. Image quality control: Color temperature, etc.
3. Monitor behavior control: Setting reset, Power saver, Color reset, etc.
4. Information on current settings
5. Preferences

## GENERAL PRODUCT SPECIFICATION

## 4.0 Visual characteristics

## 4.1 Test conditions

Unless otherwise specified, this specification is defined under the following conditions.

- (1) Input signal: As defined in 3.3, 1280 x 768 non-interlaced mode (68.7 KHz), signal sources must have 75 ohm output impedance.
- (2) Luminance setting: controls to be set to 20 ft-lb with full screen 100 % duty cycle white signal.
- (3) Warm up: more than 30 minutes after power on with signal supplied.
- (4) Ambient light: 400-- 600 lux.
- (5) Ambient temperature:  $20 \pm 5^{\circ} \text{C}$
- (6) Ambient magnetic field: no special ambient magnetic field existed.  
(the ac leakage flux, dc flux caused by transformer magnet, etc.)
- (7) CRT face: East

## 4.2 Resolution

Inspection modes ( 7 modes ) :

Mode	Resolution	H. freq. / V. freq	Standard
1.	1024 x 768	60.023KHz/75.029Hz	(VESA/75)
2.	1024 x 768	68.677KHz/84.997Hz	(VESA/85)
3.	1280 x 1024	79.976KHz/75.024Hz	(VESA/75)
4.	1280 x 1024	91.146KHz/85.024Hz	(VESA/85)
5.	1600 x 1200	93.75KHz/75.000Hz	(VESA/75)
6.	1600 x 1200	106.25KHz/85.000Hz	(VESA/85)
7.	1792 x 1344	106.3KHz/75.000Hz	(VESA/75)

## 4.3 Brightness

Color Temp	Brightness control	Contrast control	White Square (see fig-5)	Full white
	MIN	MIN	0 FL	0 FL
	CENTER	MIN	< 0.1 FL	< 0.1 FL
@9300°K	CENTER	MAX	? 30 FL	
@6500°K	CENTER	MAX	? 26 FL	
@5500°K	CENTER	MAX	? 23 FL	
@9300°K	MAX	MAX		? 30 FL

## 4.4 Flagwaving- jitter

less than 0.15 mm

## 4.5 Image size

## 4.5.1 Actual display size

The dimensions of the data area, measured along the picture center of horizontal and vertical axis of the screen, are listed below: (see Fig 1)

(392 ± 3 mm) X (294 ± 3 mm)

## 4.5.2 Max scan size

Maximum active video size should be not smaller than mask opening. The mask opening is 406.4 x 304.8 mm.

## 4.6 Image centering deviation

| A-B | and | C-D | = 6 mm, please see Fig 2

## 4.7 Picture shift range

H-shift range : total &gt; 30 mm.

V-shift range : total &gt; 15 mm.

## 4.8 Display dimension stability

Due to brightness : 1.0 %

Due to aging : 1.0 %

Due to mains voltage : 1.0 %

Dynamic : &lt; 1mm

## 4.9 Geometric distortions

Pincushion, trapezoid, parallelogram, rotation and other various distortions must remain within the limits to tolerance as in Fig. 4.

top/ bottom/left/ right : 2.5 mm Max.

top plus bottom / left plus right : 3.5 mm Max.

waviness : 1.0mm/ 50mm Max.

slope change (Max) : one

## GENERAL PRODUCT SPECIFICATION

- 4.10 Picture tilt  
 $\pm 1\text{mm}$  (see Fig. 3)  
 User adjust range for tilt : 1 deg. min.

- 4.11 Image non-linearity

Horizontal:

$$\frac{\text{Max.} - \text{Min.}}{\text{Max.} + \text{Min.}} \times 100 \% = 8 \% \quad (30 - 31.5\text{KHz})$$

$$= 7 \% \quad (31.5 - 64 \text{ KHz})$$

$$= 5 \% \quad (64 - 107 \text{ KHz})$$

$$\text{For any two adjacent blocks} = 5 \% \quad (30 - 31.5 \text{ KHz})$$

$$= 4 \% \quad (31.5 - 64 \text{ KHz})$$

$$= 3 \% \quad (64 - 107 \text{ KHz})$$

$$\text{Vertical :} = 5 \%$$

$$\text{For any two adjacent blocks} = 3 \%$$

- 4.12 Misconvergence

The maximum convergence error should be measured on a white line and represents the maximum distance between the center of the red, green and blue lines over the whole image area.

$$\text{Max. misconception :} \quad 0.15 \text{ mm in C zone (see Fig.6)}$$

$$0.30 \text{ mm in A zone}$$

$$0.40 \text{ mm in B zone}$$

- 4.13 Focus check

First, adjust brightness to 50 % position and contrast to max., and then generate "@" characters for 1024 lines to cover entire picture area (picture size is shown in sect. 4.5). Characters should be clearly identified at the center and all corners. Character size is shown in Fig. 7.

- 4.14 Brightness uniformity

With an active video area full white pattern adjusted to 20 - 22 foot lamberts, no portion of the pattern shall be less than 75 % of the luminance measured at the CRT center.

## 4.15 White color adjustment

There are three factory preset white color 9300°K, 6500°K and 5500°K.

Apply full white pattern, with brightness in 50 % position and the contrast control at max. position.

The 1931 CIE Chromaticity (color triangle) diagram (x,y) coordinate for the screen center should be:

9300°K CIE coordinates  $X = 0.283 \pm 0.015$   
 $Y = 0.297 \pm 0.015$

6500°K CIE coordinates  $X = 0.313 \pm 0.015$   
 $Y = 0.329 \pm 0.015$

5500°K CIE coordinates  $X = 0.332 \pm 0.015$   
 $Y = 0.347 \pm 0.015$

## 4.16 White uniformity

Set the brightness control at center 50 % position, then adjust the contrast control to set the luminance at the center of the screen being in the range of 20 - 22 ft-lb. The color coordinate at any point on the screen should be :

$X = X(\text{center}) \pm 0.015$   
 $Y = Y(\text{center}) \pm 0.015$

## 4.17 Color tracking on full white pattern

Adjust the contrast control from max. to min. (with brightness at click position). The color coordinates should not deviate more than:

$x = x(\text{center}) \pm 0.015$   
 $y = y(\text{center}) \pm 0.015$

## 4.18 Purity

Conditions: With full color pattern, with brightness control at 50 % position and contrast control in maximum, under the specific destinations of earth magnetic environments.

After a warm-up time of 30 min., no colored stains may occur in white, red, green and blue patterns. (the set should be well degaussed).

## GENERAL PRODUCT SPECIFICATION

### 5.0 Mechanical characteristics

#### 5.1 Controls

- |            |   |                                 |
|------------|---|---------------------------------|
| Front side | : | - AC power switch               |
|            |   | - OSD function key              |
| Rear       | : | - D- sub / BNC Selection switch |
|            |   | - Power cord socket             |
|            |   | - USB devices                   |

#### 5.2 Unit dimension / Weight

Set dimension (incl. pedestal) : 482(W) x 477(H) x 467(D) mm  
 Net weight : 24 Kg

#### 5.3 Tilt and swivel base

The display should be equipped with a tilt & swivel device allowing rotation over an angle of 90 degree left or rightward and for a tilt of -5 degree to +15 degree with respect to the horizontal position.

#### 5.4 Transportation packages

5.4.1 Shipping dimension/Weight  
 Carton dimension : 557(W) x 627(H) x 596(D) mm  
 Gross weight : 28 Kg

#### 5.4.2 Block unit / Palletization

<u>layers/block</u>	<u>sets/layer</u>	<u>sets/block unit</u>
3	4	12

<u>blocks/container</u>
<u>20 feet</u> <u>40 feet</u>
8            20

### 6.0 Environmental characteristics

The following sections define the interference and susceptibility condition limits that might occur between external environment and the display device.

## 6.1 Susceptibility of display to external environment

### Operating

- Temperature : 0 to 40 degree C
- Humidity : 10 to 90% (w/o condensation)
- Altitude : 10,000 ft

### Storage

- Temperature : -40 to 60 degree C
- Humidity : 5 to 95% (w/o condensation)
- Altitude : 40,000 ft
- Condensation : should be prevented

## 6.2 Transportation tests

Standard		European version	USA version
Drop Test	Height	50 cm	NSTA 45 cm
	Sequence	1 corner 3 faces	1 corner 3 edge 6 face
	Test Result	electrical function ok mechanical function ok no serious damage on set appearance (room temp./10°C, humidity 70 %)	
Vibration Test	Sequence	7 Hz 1.05 G 30 min. for each axis	5-100-5 Hz 0.5 G 15 min. for each axis
	Test Result	electrical function ok mechanical function ok no serious damage on set appearance	
Bump Test	For design evaluation only operating 10 G, 16 msec, 1000 cycles, z - axes pulse : half sine temperature : 23 °C humidity : 60 % air pressure : 100 kpa (according to DSD draft standard UAN-D636)		



## GENERAL PRODUCT SPECIFICATION

6.3 Display disturbances from external environment  
According to IEC 801-2 for ESD disturbances

6.4 Display disturbances to external environment

6.4.1 Ionizatic radiation  
Completely fulfilled International Commission of  
Radiological Protection (ICRP) requirement 0.5 mR/hrs.

6.4.2 EMI  
EMI : FCC PART 15 class B, D.O.C. Class B  
: VFG 243/91 (Class B)  
: CISPER 22(Class B)  
: VCCI (Class II)  
: CE mark

7.0 Reliability

7.1 Mean Time Between Failures  
MTBF to be calculated according to military standard MIL - HDBK - 217C.  
MTBF > = 75,000 hrs (excluding CRT )

$$\text{Practice of MTBF} = \frac{\text{Total hrs (power on) x Total sets}}{\text{NO. of failed sets}}$$

8.0 Quality assurance requirements

8.1 Acceptance test  
according to MIL-STD-105D Control II level

AQL : 0.65 (major)  
2.50 (minor)  
(please also refer to annual quality agreement)  
Customer acceptance criteria : UAW0377/00

9.0 Serviceability  
The serviceability of this monitor should fulfill the  
requirements which are prescribed in UAW - 0346 and must  
be checked with the check list UAT - 0361.

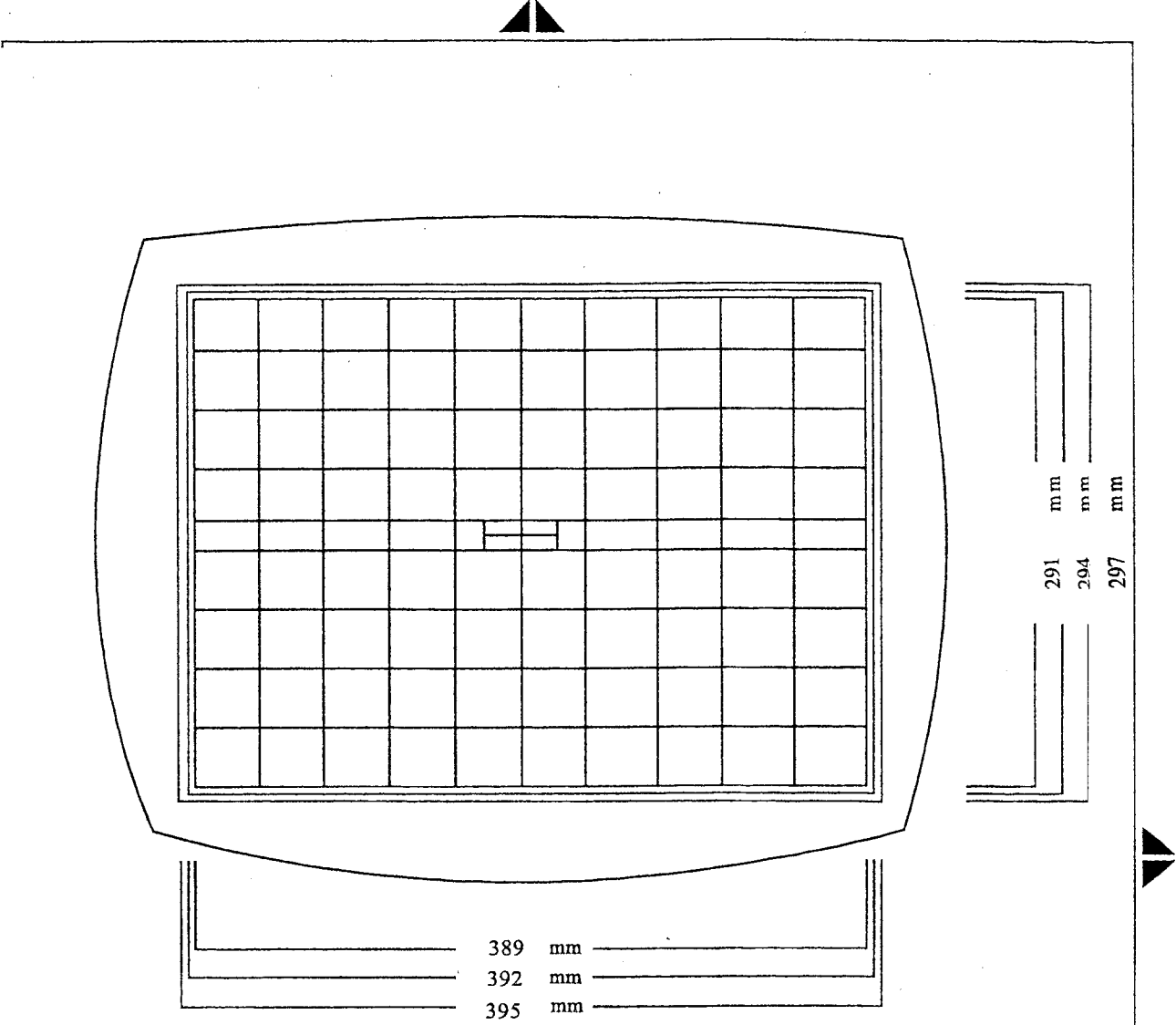
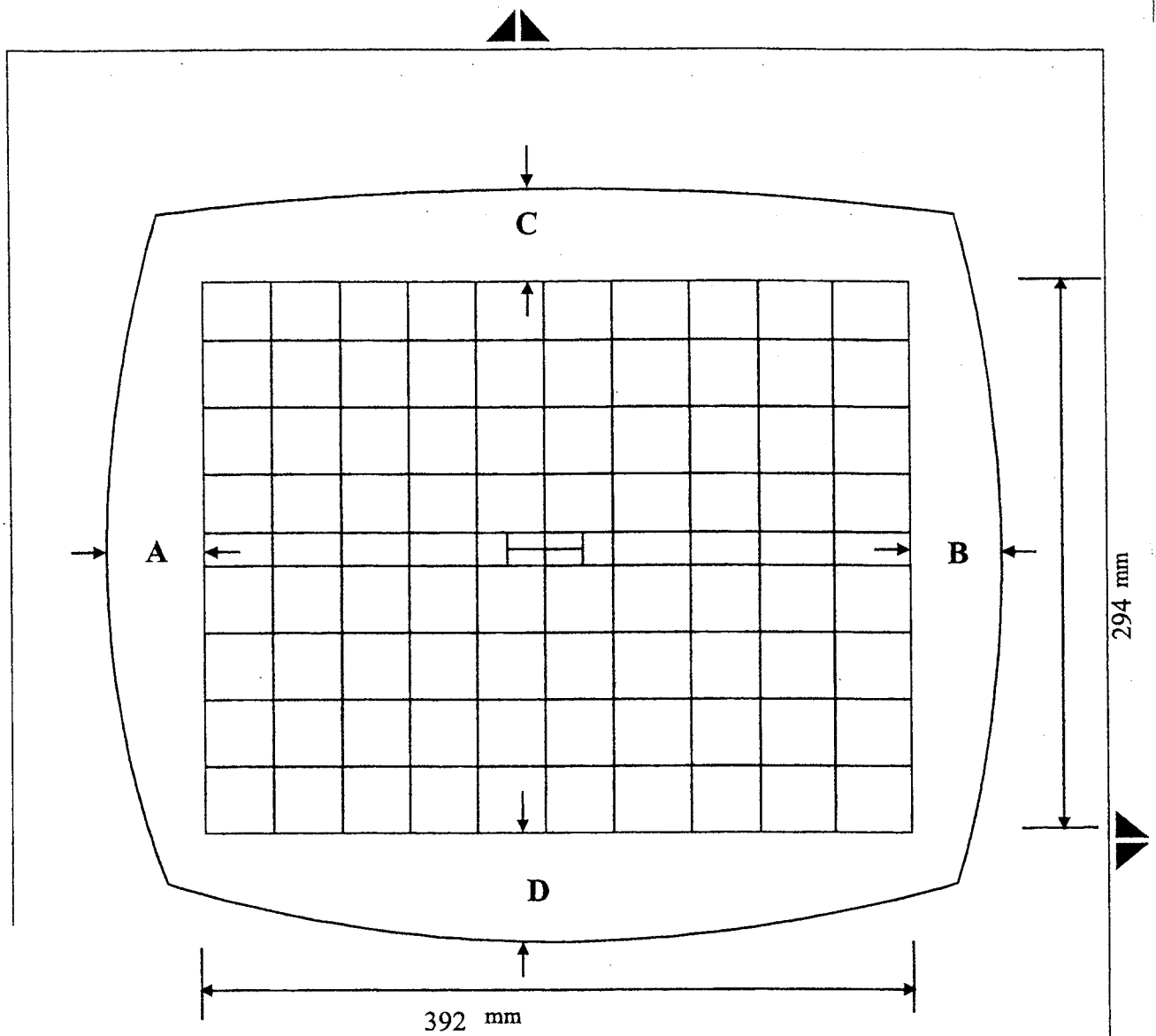


FIG-1 IMAGE DIMENSION

## GENERAL PRODUCT SPECIFICATION



$$|A-B| \text{ AND } |C-D| < 6 \text{ mm}$$

FIG-2 IMAGE CENTERING

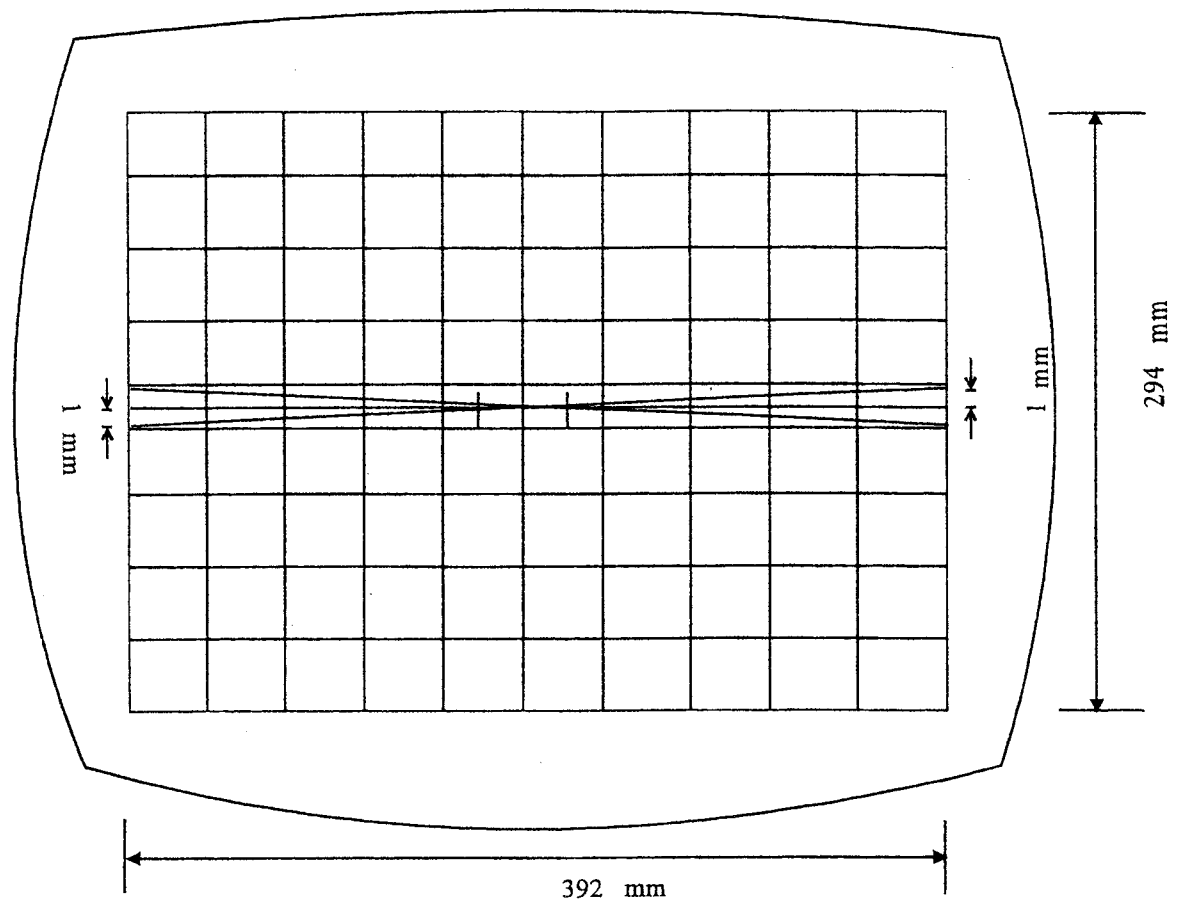
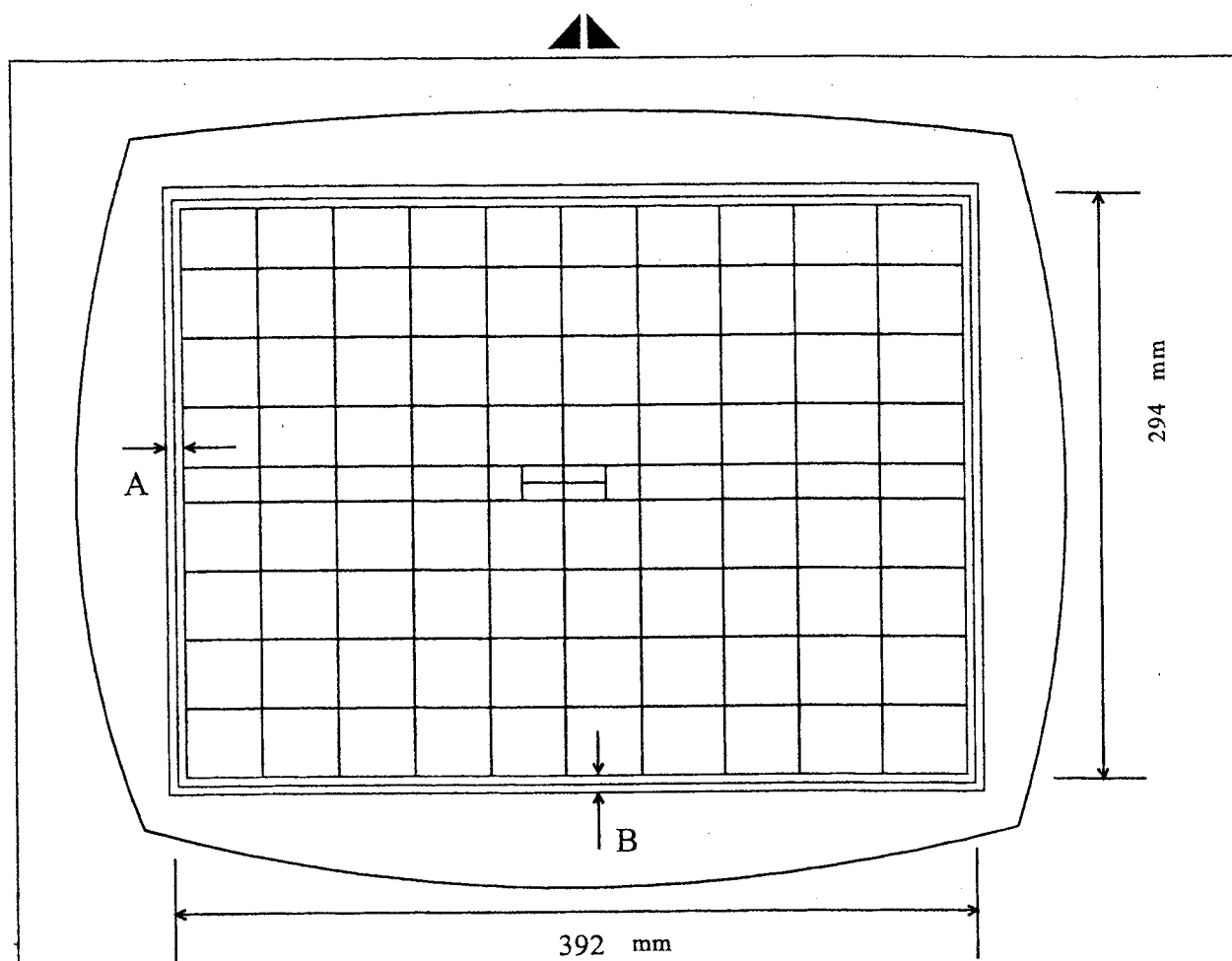


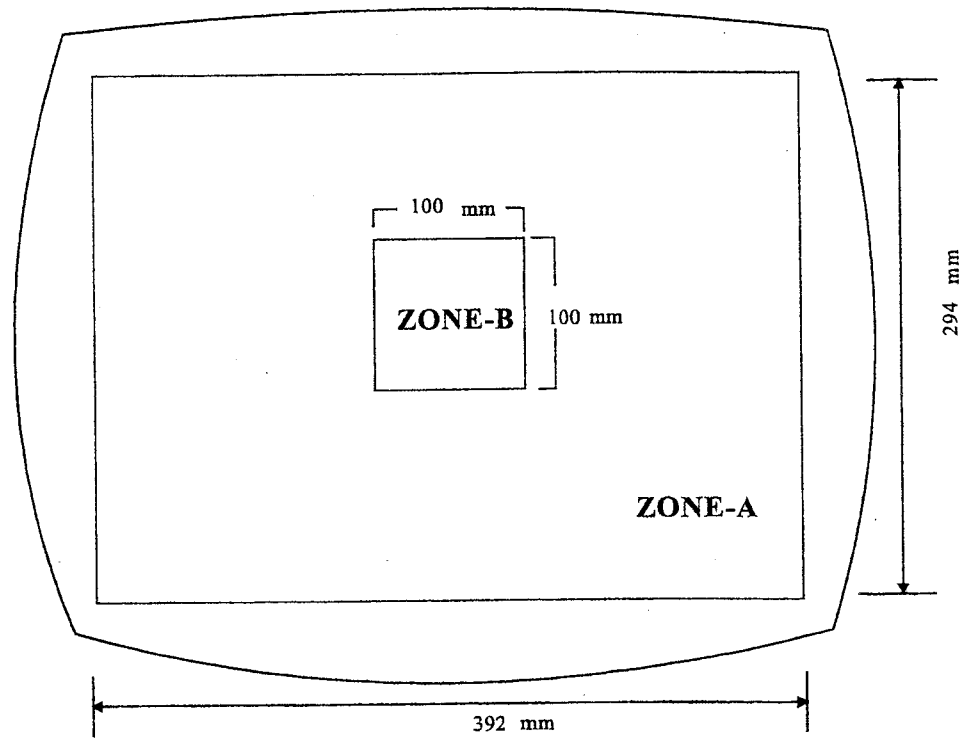
FIG-3 IMAGE ROTATION

## GENERAL PRODUCT SPECIFICATION



$$A = B = 2.5 \text{ mm}$$

FIG-4 IMAGE GEOMETRY



**FIG-5 BRIGHTNESS AND CONTRAST  
MEASUREMENT AREA**

## GENERAL PRODUCT SPECIFICATION

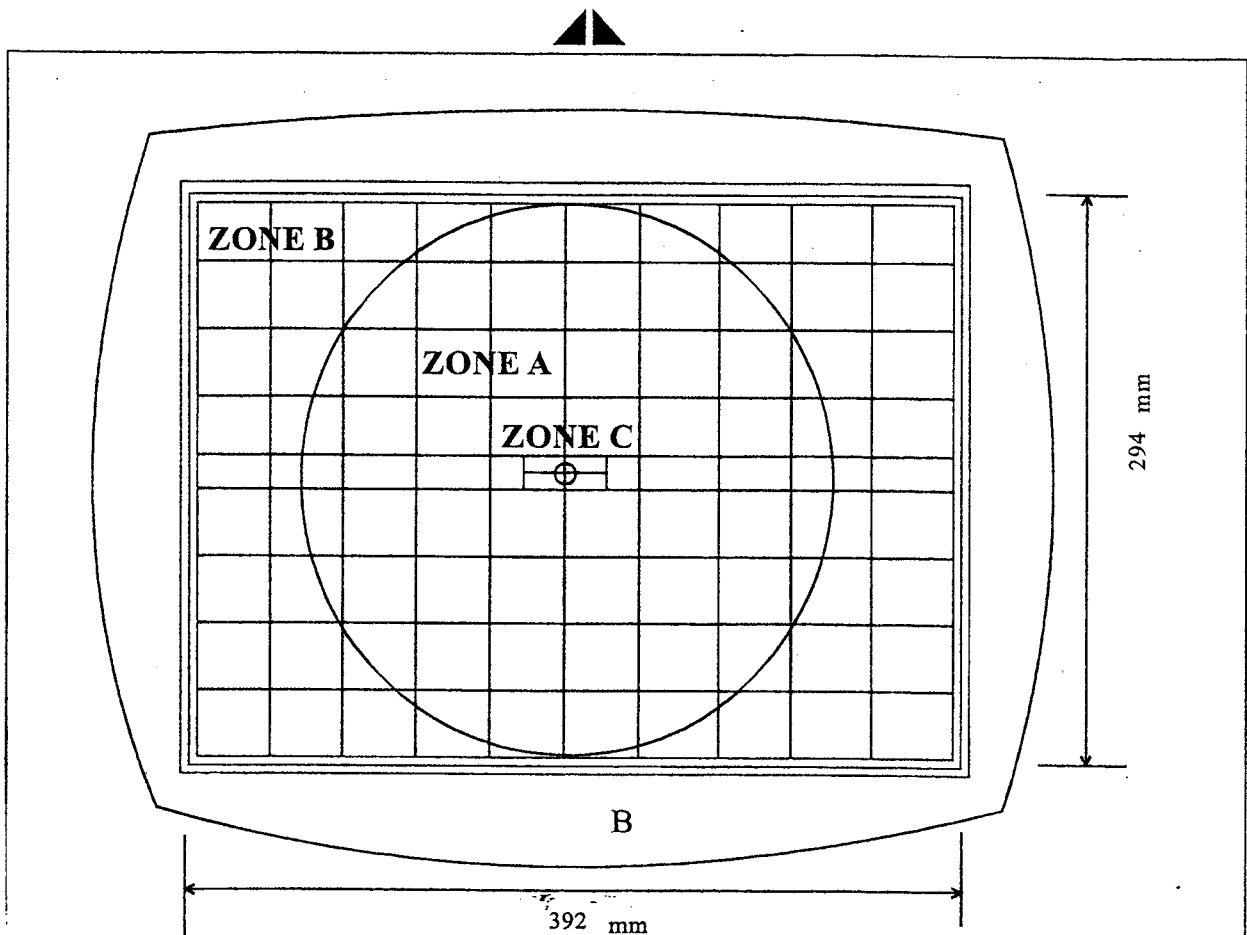


FIG-6 MISCONVERGENCE

1 BYTE = 8BITS

LINE	HEX.DATA		7	6	5	4	3	2	1	0
0	0	0								
1	0	0								
2	3	C								
3	4	2								
4	4	2								
5	5	E								
6	5	2								
7	5	2								
8	5	C								
9	4	0								
A	3	C								
B	0	0								
C	0	0								
D	0	0								
E	0	0								
F	0	0								

Fig 7 CHARACTER FORMAT FOR FOCUS CHECK



## GENERAL PRODUCT SPECIFICATION

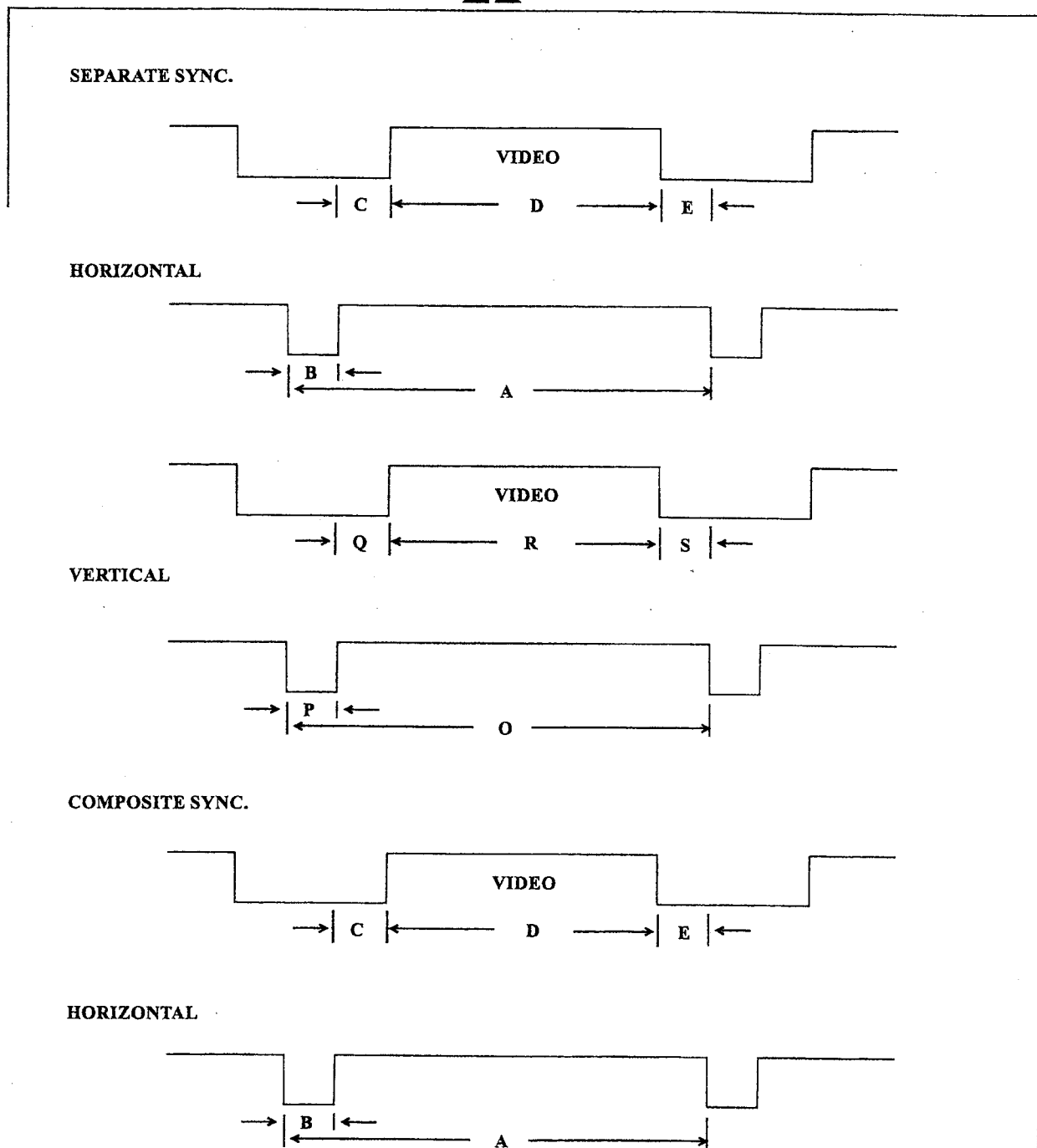


FIG-8 TIMING CHART -1

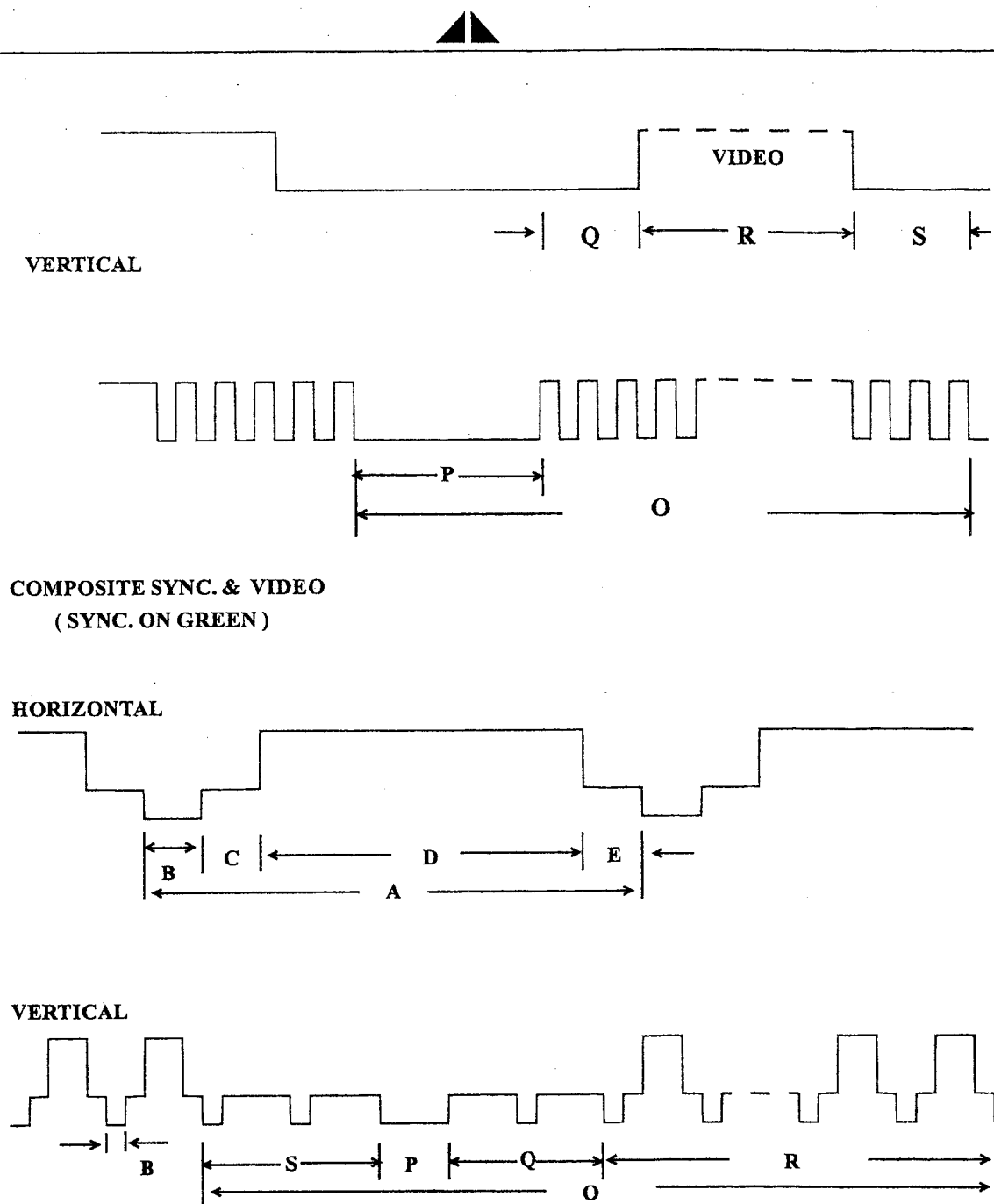
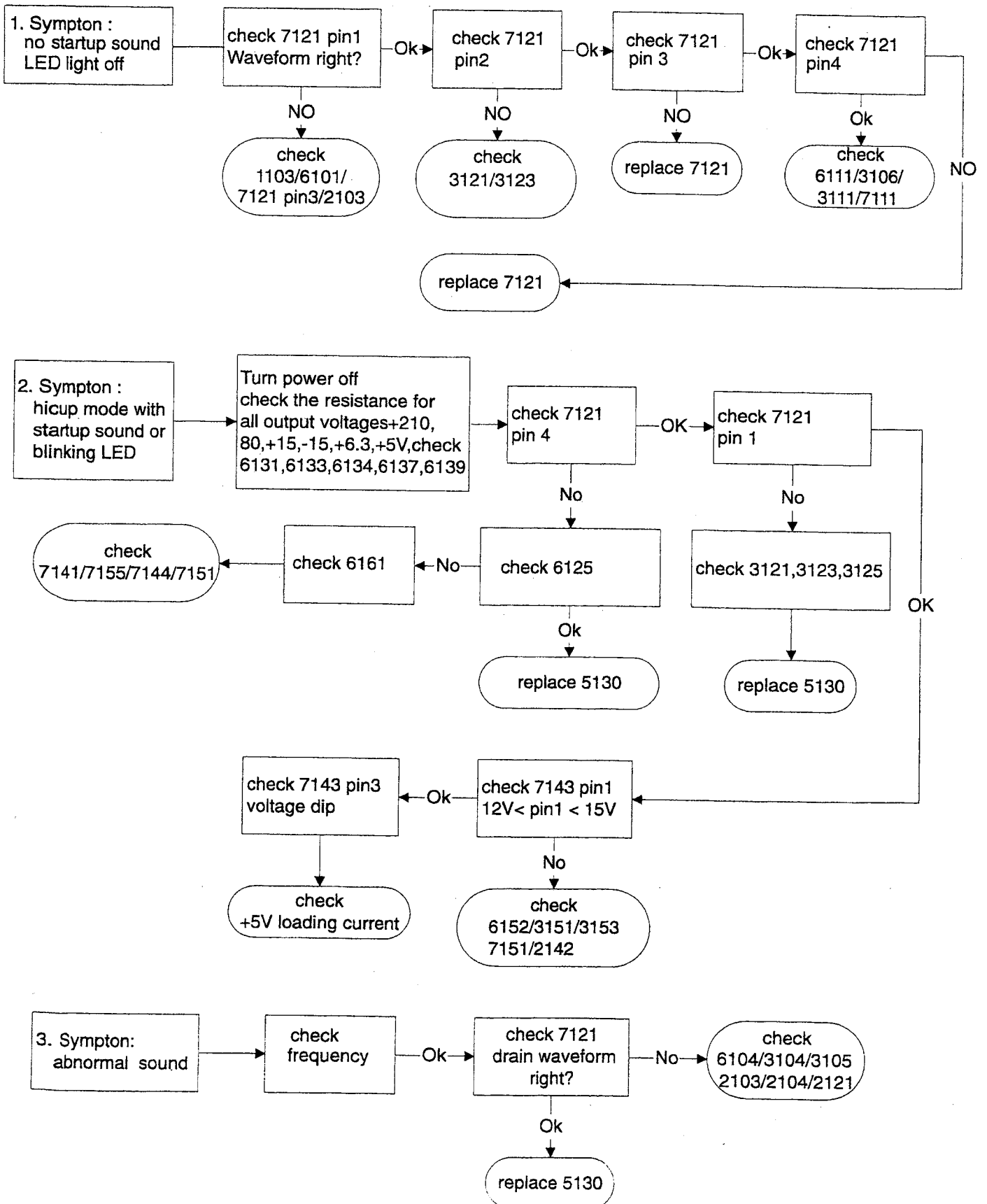


FIG-9 TIMING CHART -2

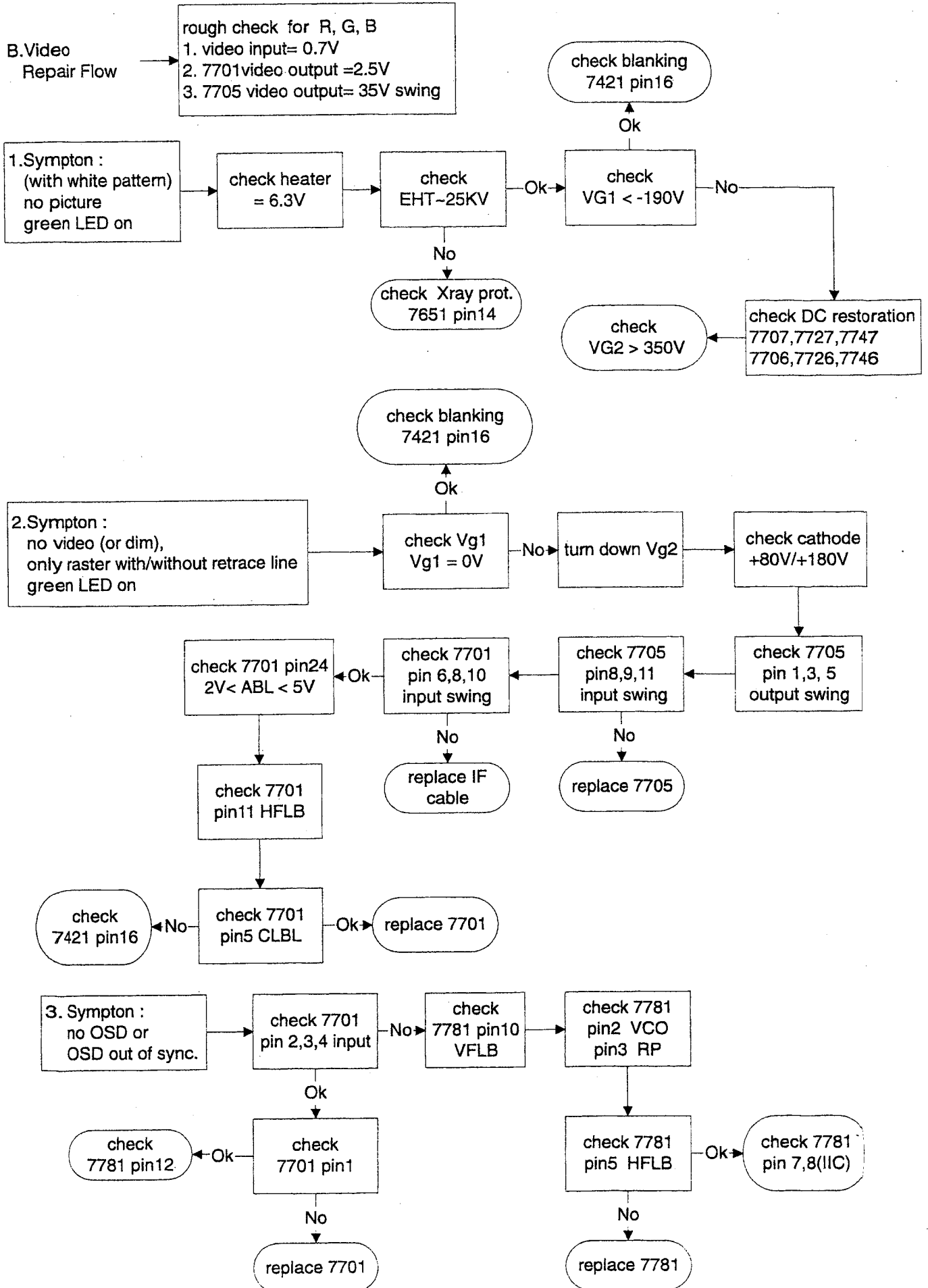
## Repair Flow Chart

## A. Power Supply Failure



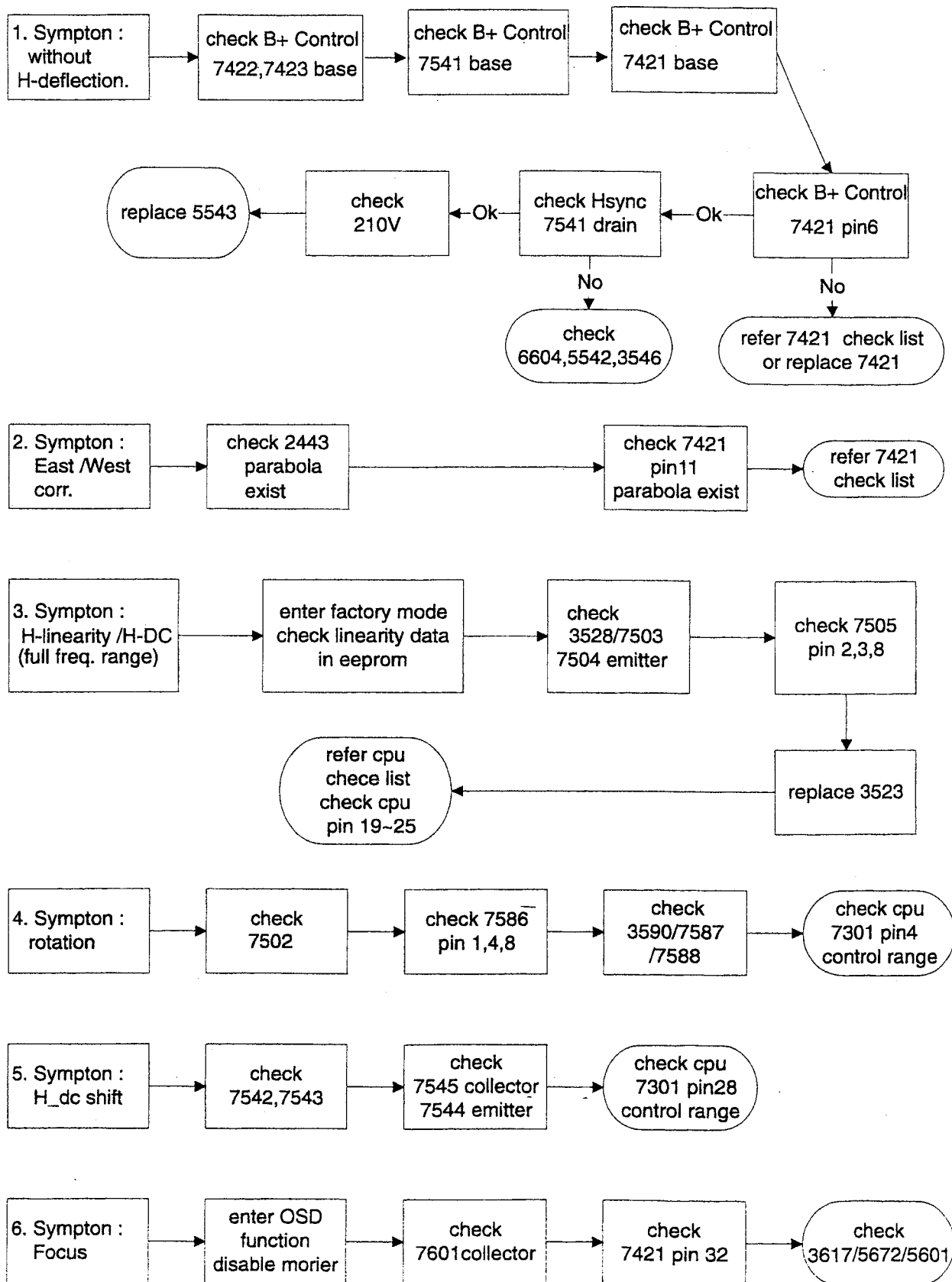
# Repair Flow Chart

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## Repair Flow Chart

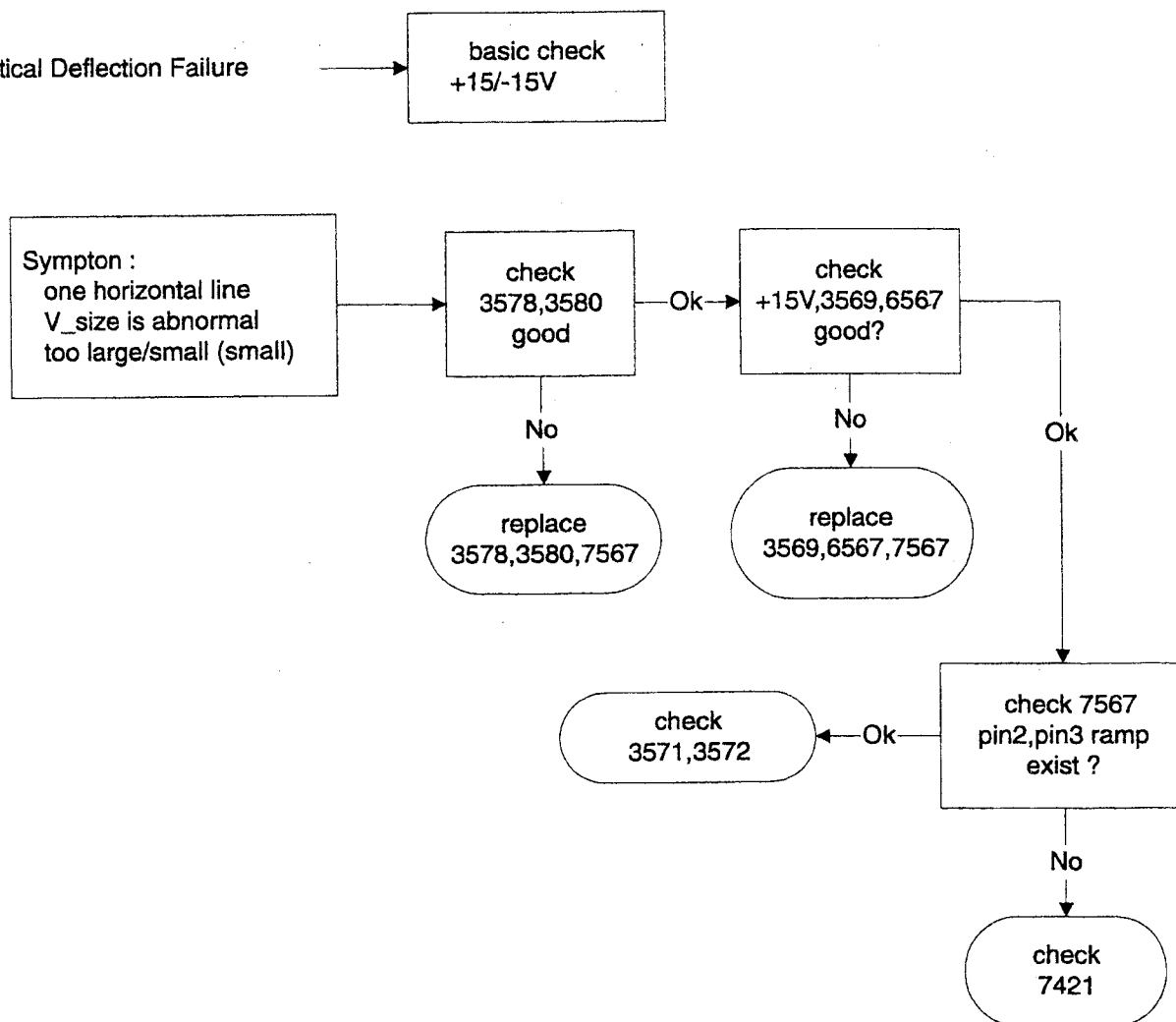
C. Horizontal deflection  
output repair flow :



## Repair Flow Chart

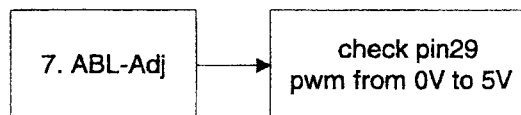
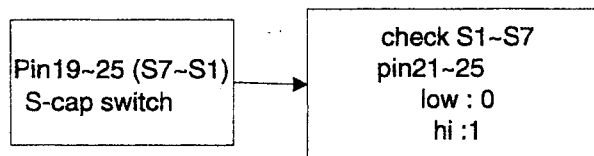
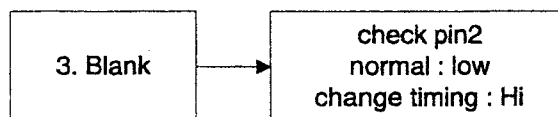
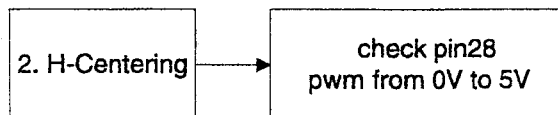
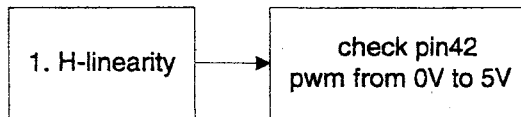
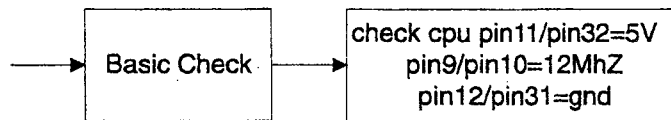
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D. Vertical Deflection Failure

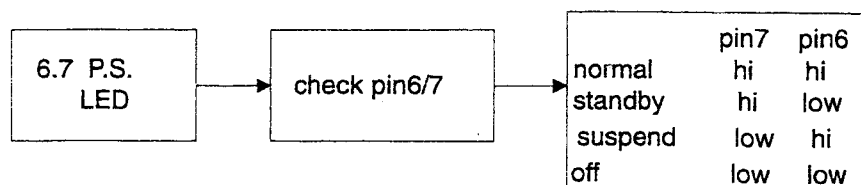
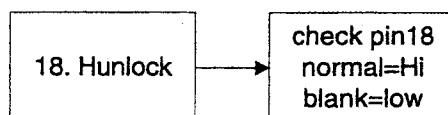
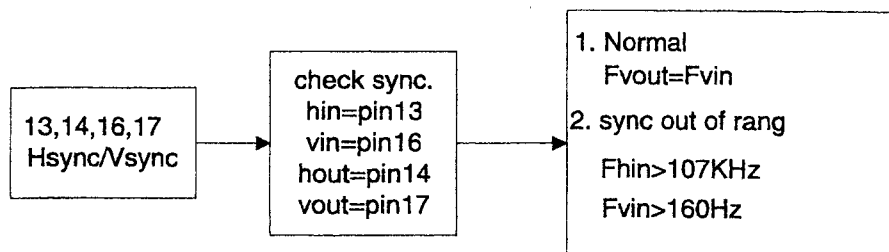


# Repair Flow Chart

E. CPU  
check list

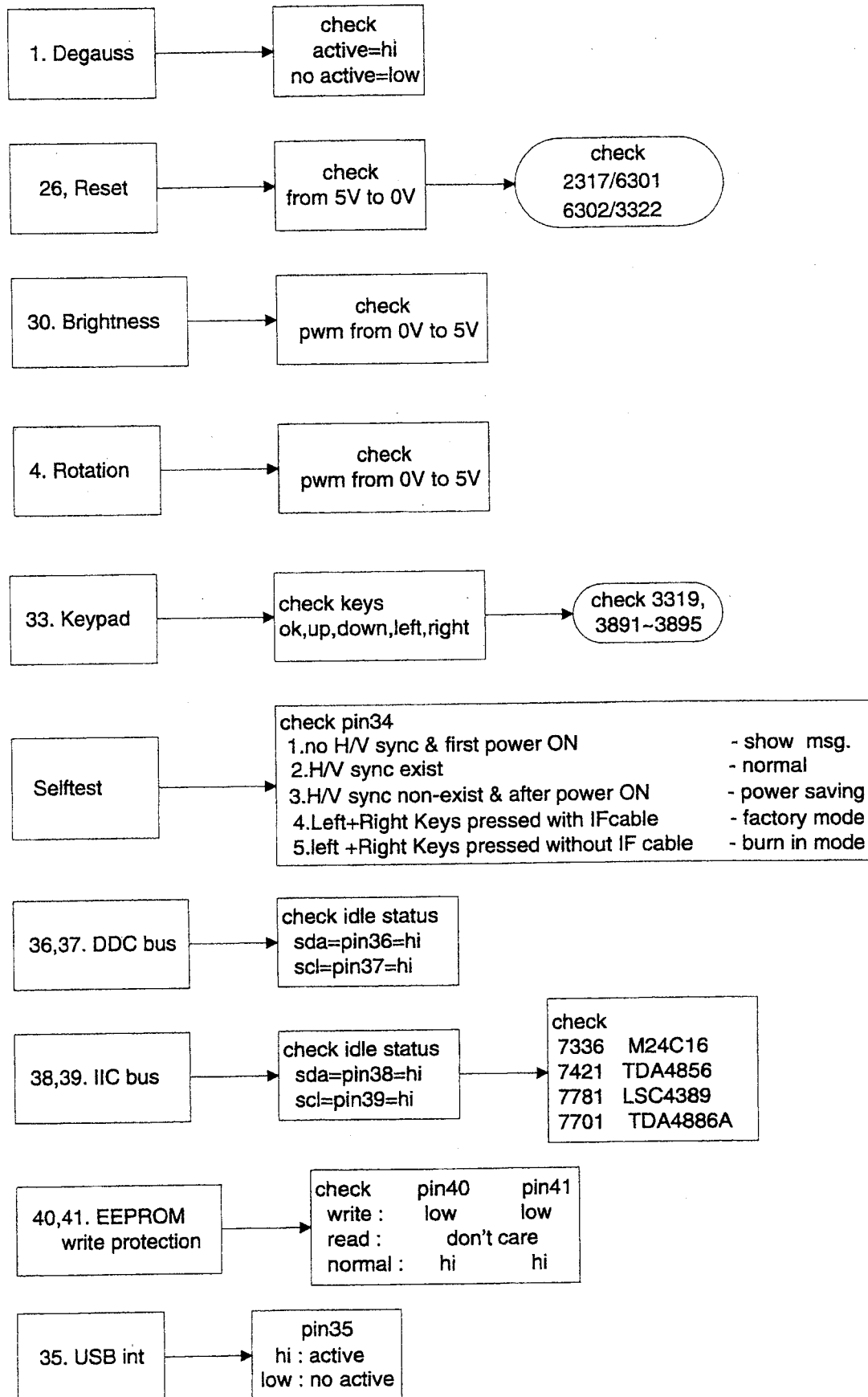


Fh-khz	S1	S2	S3	S4	S5
<-33.00	1	1	1	1	1
33.0 ~36.0	1	1	0	0	0
36.0 ~ 42.0	1	0	0	1	0
42.0 ~45.0	0	1	1	0	1
45.0 ~47.5	0	1	0	1	1
47.5 ~52.0	0	1	0	0	1
52.0 ~55.0	0	1	0	0	0
55.0 ~61.5	0	0	1	1	0
61.5 ~65.0	0	0	0	1	1
65.0 ~70.0	0	0	1	0	0
70.0 ~77.0	0	0	0	1	1
77.0 ~83.0	0	0	0	1	0
83.0 ~95.0	0	0	0	0	1
95.0-<	0	0	0	0	0



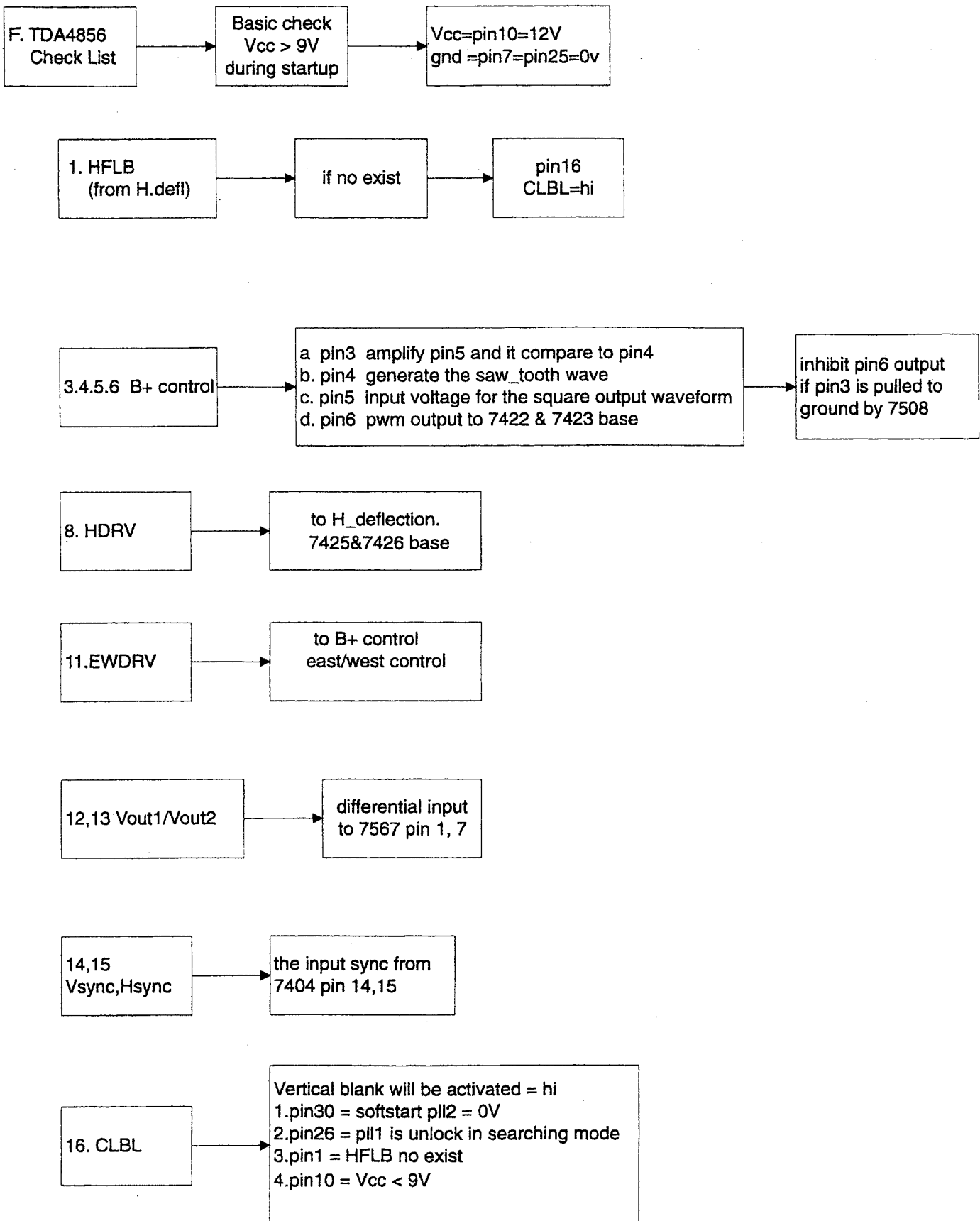
# Repair Flow Chart

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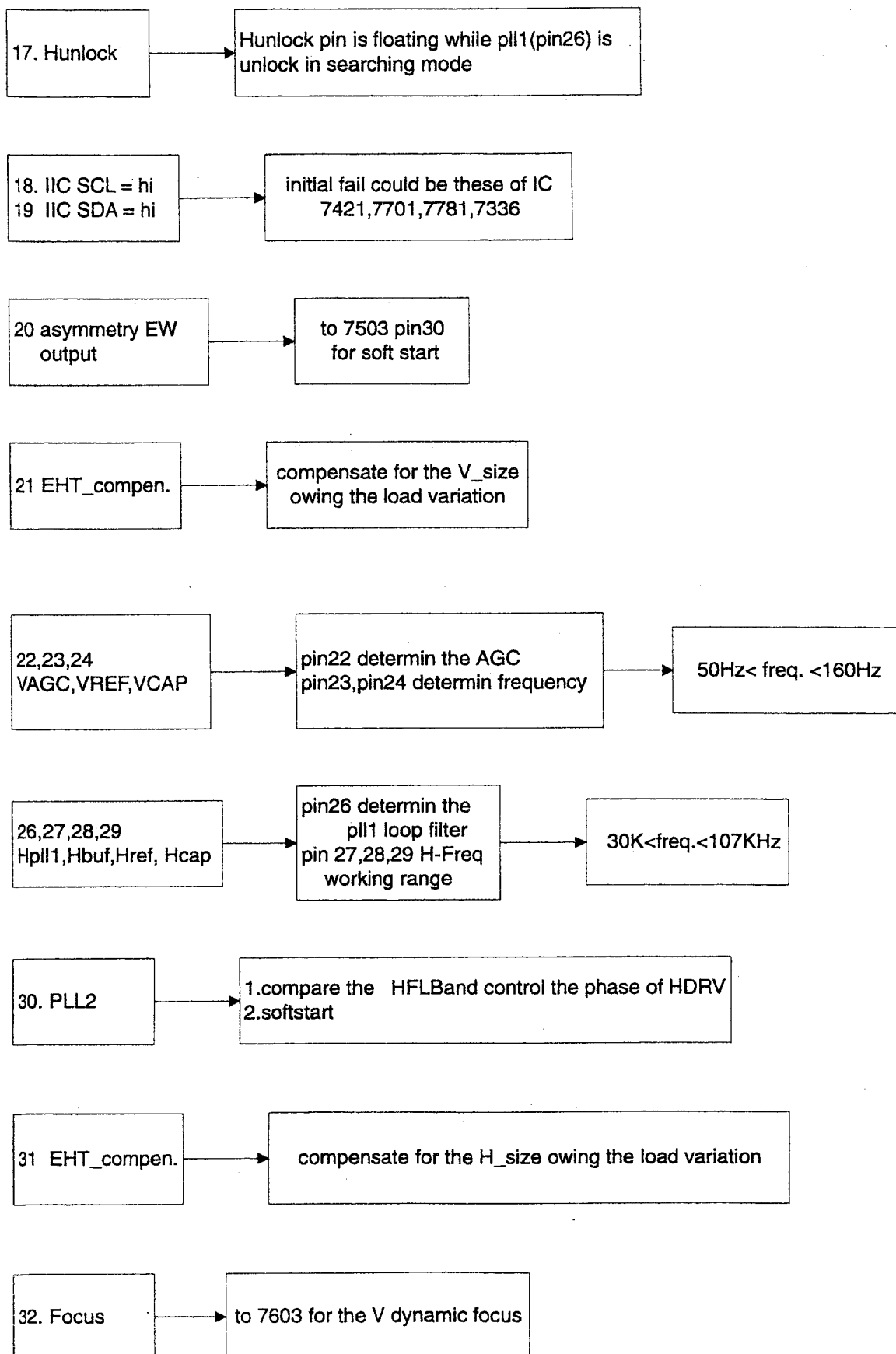


# Repair Flow Chart



## Repair Flow Chart

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# TELEVISION/MONITOR SAFETY GUIDELINES FOR THE PROFESSIONAL SERVICE TECHNICIAN

## Safety Checks

After the original service problem has been corrected, a complete safety check should be made. Be sure to check over the entire set, not just the areas where you have worked. Some previous servicer may have left an unsafe condition, which could be unknowingly passed on to your customer. Be sure to check all of the following:

### Fire and Shock Hazard

1. Be sure all components are positioned in such a way as to avoid the possibility of adjacent component shorts. This is especially important on those chassis which are transported to and from the service shop.
2. Never release a repaired unit unless all protective devices such as insulators, barriers, covers, strain reliefs, and other hardware have been installed in accordance with the original design.
3. Soldering and wiring must be inspected to locate possible cold solder joints, solder splashes, sharp solder points, frayed leads, pinched leads, or damaged insulation (including the ac cord). Be certain to remove loose solder balls and all other loose foreign particles.
4. Check across-the-line components and other components for physical evidence of damage or deterioration and replace if necessary. Follow original layout, lead length, and dress.
5. No lead or component should touch a receiving tube or a resistor rated at 1 watt or more. Lead tension around protruding metal surfaces or edges must be avoided.
6. Critical components having special safety characteristics are identified with an s by the Ref. No. in the parts list and enclosed within a broken line\* (where several critical components are grouped in one area) along with the safety symbols on the schematic diagrams and/or exploded views.
7. When servicing any unit, always use a separate isolation transformer for the chassis. Failure to use a separate isolation transformer may expose you to possible shock hazard, and may cause damage to servicing instruments.
8. Many electronic products use a polarized ac line cord (one wide pin on the plug). Defeating this safety feature may create a potential hazard to the servicer and the user. Extension cords which do not incorporate the polarizing feature should never be used.
9. After reassembly of the unit, always perform an ac leakage test or resistance test from the line cord to all exposed metal parts of the cabinet. Also, check all metal control shafts (with knobs removed), antenna terminals, handles, screws, etc. to be sure the unit may be safely operated without danger of electrical shock.

\* Broken line — — — — —

### Implosion

1. All picture tubes used in current model receivers are equipped with an integral implosion system. Care should always be used, and safety glasses worn, whenever handling any picture tube. Avoid scratching or otherwise damaging the picture tube during installation.
2. Use only replacement tubes specified by the manufacturer.

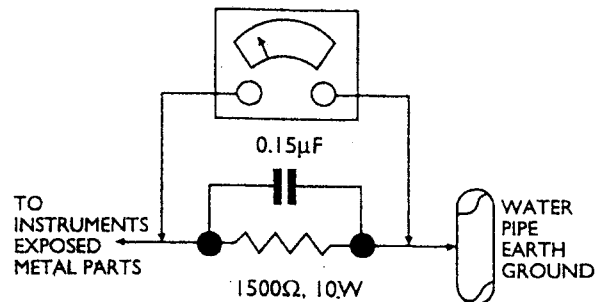
### X-radiation

1. Be sure procedures and instructions to all your service personnel cover the subject of X-radiation. Potential sources of X-rays in TV receivers are the picture tube and the high voltage circuits. The basic precaution which must be exercised is to keep the high voltage at the factory recommended level.
2. To avoid possible exposure to X-radiation and electrical shock, only the manufacturer's specified anode connectors must be used.
3. It is essential that the service technician has an accurate HV meter available at all times. The calibration of this meter should be checked periodically against a reference standard.
4. When the HV circuitry is operating properly there is no possibility of an X-radiation problem. High voltage should always be kept at the manufacturer's rated value - no higher - for optimum performance. Every time a color set is serviced, the brightness should be run up and down while monitoring the HV with a meter to be certain that the HV is regulated correctly and does not exceed the specified value. We suggest that you and your technicians review test procedures so that HV and HV regulation are always checked as a standard servicing procedure, and the reason for this prudent routine is clearly understood by everyone. It is important to use an accurate and reliable HV meter. It is recommended that the HV reading be recorded on each customer's invoice, which will demonstrate a proper concern for the customer's safety.
5. When troubleshooting and making test measurements in a receiver with a problem of excessive high voltage, reduce the line voltage by means of a Variac to bring the HV into acceptable limits while troubleshooting. Do not operate the chassis longer than necessary to locate the cause of the excessive HV.

6. New picture tubes are specifically designed to withstand higher operating voltages without creating undesirable X-radiation. It is strongly recommended that any shop test fixture which is to be used with the new higher voltage chassis be equipped with one of the new type tubes designed for this service. Addition of a permanently connected HV meter to the shop test fixture is advisable. The CRT types used in these new sets should never be replaced with any other types, as this may result in excessive X-radiation.
7. It is essential to use the specified picture tube to avoid a possible X-radiation problem.
8. Most TV receivers contain some type of emergency "Hold Down" circuit to prevent HV from rising to excessive levels in the presence of a failure mode. These various circuits should be understood by all technicians servicing them, especially since many hold down circuits are inoperative as long as the receiver performs normally.

### Leakage Current Cold Check

1. Unplug the ac line cord and connect a jumper between the two prongs of the plug.
2. Turn on the power switch.
3. Measure the resistance value between the jumpered ac plug and all exposed cabinet parts of the receiver, such as screw heads, antennas, and control shafts. When the exposed metallic part has a return path to the chassis, the reading should be between 1 megohm and 5.2 megohms. When the exposed metal does not have a return path to the chassis, the reading must be infinity. Remove the jumper from the ac line cord.



### Leakage Current Hot Check

1. Do not use an isolation transformer for this test. Plug the completely reassembled receiver directly into the ac outlet.
2. Connect a 1.5k, 10W resistor paralleled by a 0.15µF capacitor between each exposed metallic cabinet part and a good earth ground such as a water pipe, as shown above.
3. Use an ac voltmeter with at least 5000 ohms/ volt sensitivity to measure the potential across the resistor.
4. The potential at any point should not exceed 0.75 volts. A leakage current tester may be used to make this test; leakage current must not exceed 0.5milliamps. If a measurement is outside of the specified limits, there is a possibility of shock hazard. The receiver should be repaired and rechecked before returning it to the customer.
5. Repeat the above procedure with the ac plug reversed. (Note: An ac adapter is necessary when a polarized plug is used. Do not defeat the polarizing feature of the plug.)

### Picture Tube Replacement

The primary source of X-radiation in this television receiver is the picture tube. The picture tube utilized in this chassis is specially constructed to limit X-radiation emissions. For continued X-radiation protection, the replacement tube must be the same type as the original, including suffix letter, or a approved type.

### Parts Replacement

Many electrical and mechanical parts in television sets have special safety related characteristics. These characteristics are often not evident from visual inspection nor can the protection afforded by them necessarily be obtained by using replacement components rated for higher voltage, wattage, etc. The use of a substitute part which does not have the same safety characteristics as the recommended replacement part shown in this service manual may create shock, fire, or other hazards.

**WARNING:** Before removing the CRT anode cap, turn the unit OFF and short the HIGH VOLTAGE to the CRT DAG ground.  
**SERVICE NOTE:** The CRT DAG is not at chassis ground.